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RIVERS AND HARBORS—FLOOD CONTROL

OF MICHIGAN
SEP 10 1959
MAIN READING ROOM

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON PUBLIC WORKS UNITED STATES SENATE

EIGHTY-SIXTH CONGRESS

FIRST SESSION

ON

H.R. 7634

AUTHORIZING THE CONSTRUCTION, REPAIR, AND PRESERVATION OF CERTAIN PUBLIC WORKS ON RIVERS AND HARBORS FOR NAVIGATION, FLOOD CONTROL, AND FOR OTHER PURPOSES

AND

S. 1902

AUTHORIZING ADDITIONAL APPROPRIATIONS FOR PROSECUTION OF PROJECTS IN CERTAIN COMPREHENSIVE RIVER BASIN PLANS FOR FLOOD CONTROL, NAVIGATION, AND FOR OTHER PURPOSES

PART 1

AUGUST 4, 1959

Printed for the use of the Committee on Public Works

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RIVERS AND HARBORS—FLOOD CONTROL

TUESDAY, AUGUST 4, 1959

U.S. SENATE, SUBCOMMITTEE ON
FLOOD CONTROL—RIVERS AND HARBORS,
OF THE COMMITTEE ON PUBLIC WORKS,
Washington, D.C.

The subcommittee met, pursuant to call, at 11:15 a.m., in room 4200, Senate Office Building, Hon. Robert S. Kerr (chairman of the subcommittee) presiding.

Present: Senators Kerr, Randolph, Young (Ohio), Moss, Case (South Dakota), and Cooper.

Senator KERR. Good morning, General.

General, this committee is always happy to have you come before it and talk to us about projects and progress on the development of water resources. We are happy to receive from you and your staff information on the projects upon which we must take action and report to the Senate. We have before us H.R. 7634, the rivers and harbors, beach erosion control, and flood control omnibus bill which has passed the House of Representatives and has been referred to this committee of the Senate, and S. 1902.

(The bills referred to are as follows:)

[H.R. 7634, 86th Cong., 1st sess.]

AN ACT Authorizing the construction, repair, and preservation of certain public works on rivers and harbors for navigation, flood control, and for other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—RIVERS AND HARBORS

SEC. 101. That the following works of improvement of rivers and harbors and other waterways for navigation, flood control, and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and supervision of the Chief of Engineers, in accordance with the plans and subject to the conditions recommended by the Chief of Engineers in the respective reports hereinafter designated: *Provided*, That the provisions of section 1 of the River and Harbor Act approved March 2, 1945 (Public Law Numbered 14, Seventy-ninth Congress, first session), shall govern with respect to projects authorized in this title; and the procedures therein set forth with respect to plans, proposals, or reports for works of improvement for navigation or flood control and for irrigation and purposes incidental thereto, shall apply as if herein set forth in full:

NAVIGATION

Southwest Harbor, Maine: House Document Numbered 408, Eighty-fifth Congress, at an estimated cost of $240,000;

Stonington Harbor, Maine: House Document Numbered 36, Eighty-sixth Congress, at an estimated cost of $198,000;

South Bristol Harbor, Maine: Senate Document Numbered 30, Eighty-sixth Congress, at an estimated cost of $97,000;

Wells Harbor, Maine: House Document Numbered 202, Eighty-sixth Congress, at an estimated cost of $340,000;

Cotuit Harbor, Massachusetts: House Document Numbered 142, Eighty-sixth Congress, at an estimated cost of $320,000;

Apponaug Cove, Rhode Island: House Document Numbered 143, Eighty-sixth Congress, at an estimated cost of $180,000;

Moriches and Shinecock Inlets, New York: House Document Numbered 126, Eighty-sixth Congress, at an estimated cost of $6,858,000;

Shem Creek, Charleston Harbor, South Carolina: House Document Numbered 35, Eighty-sixth Congress, maintenance;

Pascagoula Harbor, Mississippi: House Document Numbered 98, Eighty-sixth Congress, maintenance;

Everglades Harbor, Florida: House Document Numbered 147, Eighty-sixth Congress, at an estimated cost of $117,200;

Gulf Coast Shrimp Boat Harbors, Florida: House Document Numbered 183, Eighty-sixth Congress, at an estimated cost of $373,000;

Bakers Haulover Inlet, Florida: House Document Numbered 189, Eighty-sixth Congress, at an estimated cost of $239,000;

Miami Harbor, Florida: Senate Document Numbered 71, Eighty-fifty Congress, at an estimated cost of $3,818,000;

Bayou Lafourche and Lafourche—Jump Waterway, Louisiana: House Document Numbered 112, Eighty-sixth Congress, at an estimated cost of $4,664,000;

Bayous Petit Anse, Tigre, and Carlin, Louisiana: Senate Document Numbered 70, Eighty-fifth Congress, at an estimated cost of $106,000;

Gulf Intracoastal Waterway, channel to Port Mansfield, Texas: Senate Document Numbered 11, Eighty-sixth Congress, at an estimated cost of $3,431,000;

In addition to previous authorizations, there is hereby authorized the completion of the Barkley Dam project in Kentucky, authorized by the River and Harbor Act of 1954, at an estimated additional cost of $146,000,000;

Mississippi River between Missouri River and Minneapolis, Minnesota at Dubuque, Iowa: House Document Numbered 56, Eighty-sixth Congress, at an estimated cost of $38,000;

Red Wing Harbor, Minnesota: House Document Numbered 32, Eighty-sixth Congress, at an estimated cost of $170,400;

Menominee Harbor and River, Michigan and Wisconsin: House Document Numbered 113, Eighty-sixth Congress, at an estimated cost of $715,000;

Kewaunee Harbor, Wisconsin: Senate Document Numbered 19, Eighty-sixth Congress, at an estimated cost of $81,900;

Two Harbors, Minnesota: House Document Numbered 146, Eighty-sixth Congress, at an estimated cost of $162,000;

Duluth-Superior Harbor, Minnesota and Wisconsin: House Document Numbered 150, Eighty-sixth Congress, at an estimated cost of $2,364,000;

Duluth-Superior Harbor, Minnesota and Wisconsin: House Document Numbered 196, Eighty-sixth Congress, at an estimated cost of $2,513,000;

Ashland Harbor, Wisconsin: House Document Numbered 165, Eighty-sixth Congress, at an estimated cost of $1,495,000;

Presque Isle Harbor, Michigan: House Document Numbered 145, Eighty-sixth Congress, at an estimated cost of $215,300;

Marquette Harbor, Michigan: House Document Numbered 154, Eighty-sixth Congress, at an estimated cost of $236,000;

Calumet Harbor, Illinois and Indiana: House Document Numbered 149, Eighty-sixth Congress, at an estimated cost of $5,240,000;

Indiana Harbor, Indiana: House Document Numbered 195, Eighty-sixth Congress, at an estimated cost of $974,000;

Toledo Harbor, Ohio: House Document Numbered 153, Eighty-sixth Congress, at an estimated cost of $14,684,000;

Sandusky Harbor, Ohio: House Document Numbered 144, Eighty-sixth Congress, at an estimated cost of $5,800,000;

Cleveland Harbor, Ohio: House Document Numbered 152, Eighty-sixth Congress, at an estimated cost of $2,486,000;

Lorain Harbor, Ohio: House Document Numbered 166, Eighty-sixth Congress, at an estimated cost of $19,323,000;

Ashtabula Harbor, Ohio: House Document Numbered 148, Eighty-sixth Congress, at an estimated cost of $4,077,000;

Erie Harbor, Pennsylvania: House Document Numbered 199, Eighty-sixth Congress, at an estimated cost of $1,729,000;

Buffalo Harbor, New York: House Document Numbered 151, Eighty-sixth Congress, at an estimated cost of $2,352,000;

Kahului Harbor, Island of Maui, Hawaii: House Document Numbered 109, Eighty-sixth Congress, at an estimated cost of $944,500;

BEACH EROSION CONTROL

South Kingstown and Westerly, Rhode Island: House Document Numbered 30, Eighty-sixth Congress, at an estimated cost of $140,300;

Key West, Florida: House Document Numbered 413, Eighty-fifth Congress, at an estimated cost of $231,200.

SEC. 102. That the Secretary of the Army is hereby authorized to reimburse local interests for such work done by them, on the beach erosion projects authorized in section 101, subsequent to the initiation of the cooperative studies which form the basis for the projects: *Provided*, That the work which may have been done on these projects is approved by the Chief of Engineers as being in accordance with the projects hereby adopted: *Provided further*, That such reimbursement shall be subject to appropriations applicable thereto or funds available therefor and shall not take precedence over other pending projects of higher priority for improvements.

SEC. 103. The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the following-named localities and subject to all applicable provisions of section 10 of the River and Harbor Act of 1950:

Calf Island, between Roque Island Bluffs and Seawall Point, Maine.
Green Harbor, Marshfield, Massachusetts.
Nauset Harbor, Massachusetts.
Eel Pond, Menauhant, Massachusett
Pleasant Bay, Massachusetts.
Rye Harbor (Playland Marina), New York.
Sturgeon Creek, Middlesex County, Virginia.
Beresford Creek, South Carolina.
Lake Pontchartrain, Louisiana.
Washburn Harbor, Wisconsin.

SEC. 104. Title I of this Act may be cited as the "River and Harbor Act of 1959".

TITLE II—FLOOD CONTROL

SEC. 201. That section 3 of the Act approved June 22, 1936 (Public Law Numbered 738, Seventy-fourth Congress), as amended by section 2 of the Act approved June 28, 1938 (Public Law Numbered 761, Seventy-fifth Congress), shall apply to all works authorized in this title except that for any channel improvement or channel rectification project, provisions (a), (b), and (c) of section 3 of said Act of June 22, 1936, shall apply thereto, and except as otherwise provided by law: *Provided*, That the authorization for any flood-control project herein adopted requiring local cooperation shall expire five years from the date on which local interests are notified in writing by the Department of the Army of the requirements of local cooperation, unless said interests shall within said time furnish assurances satisfactory to the Secretary of the Army that the required cooperation will be furnished.

SEC. 202. The provisions of section 1 of the Act of December 22, 1944 (Public Law Numbered 534, Seventy-eighth Congress, second session), shall govern with respect to projects authorized in this Act, and the procedures therein set forth with respect to plans, proposals, or reports for works of improvement for navigation or flood control and for irrigation and purposes incidental thereto shall apply as if herein set forth in full.

SEC. 203. The following works of improvement for the benefit of navigation and the control of destructive floodwaters and other purposes are hereby adopted and authorized to be prosecuted under the direction of the Secretary of the Army and the supervision of the Chief of Engineers in accordance with the plans in the respective reports hereinafter designated and subject to the conditions set forth therein: *Provided*, That the necessary plans, specifications, and preliminary work may be prosecuted on any project authorized in this title with funds from appropriations heretofore or hereafter made for flood control so as to be ready for rapid inauguration of a construction program: *Provided further*, That the projects authorized herein shall be initiated as expeditiously and prosecuted as vigorously as may be consistent with budgetary requirements: *And provided further*, That penstocks and other similar facilities adapted to possible future use in the develop-

ment of hydroelectric power shall be installed in any dam authorized in this Act for construction by the Department of the Army when approved by the Secretary of the Army on the recommendation of the Chief of Engineers and the Federal Power Commission.

BLACKSTONE RIVER BASIN

The project for flood protection on Blackstone, Mill, and Peters Rivers, in Woonsocket, Rhode Island, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in Senate Document Numbered 87, Eighty-fifth Congress, at an estimated cost of $2,970,000.

THAMES RIVER BASIN

The project for the West Thompson Reservoir on the Quinebaug River, Connecticut, is hereby authorized substantially as recommended by the Chief of Engineers in Senate Document Numbered 41, Eighty-sixth Congress, at an estimated cost of $4,010,000.

CENTRAL AND SOUTHERN FLORIDA

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $1,000,000 for the prosecution of the central and southern Florida comprehensive plan for flood control and other purposes approved in the Flood Control Act of 1948, and subsequent Acts of Congress.

TRINITY RIVER BASIN

The comprehensive plan for improvement of the Trinity River and tributaries, Texas, as authorized by the River and Harbor Act of 1945, is modified to provide for construction of the Bardwell Reservoir on Waxahachie Creek, in the Richland, Chambers, and Cedar Creeks watershed, at an estimated ultimate net Federal cost for construction in addition to that now authorized of $5,104,000, substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 424, Eighty-fifth Congress.

GUADALUPE RIVER BASIN

The project for flood control on Blieders Creek, Texas, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 180, Eighty-sixth Congress, at an estimated cost of $1,060,000.

WHITE RIVER BASIN

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $32,000,000, for the prosecution of the comprehensive plan for the White River Basin authorized by the Flood Control Act of June 28, 1938, as amended and supplemented by subsequent Acts of Congress.

ARKANSAS RIVER BASIN

The general comprehensive plan for flood control and other purposes for the Arkansas River Basin, approved by the Act of June 28, 1938, as amended, and the multiple-purpose plan for the Arkansas River and tributaries, Arkansas and Oklahoma, approved by the River and Harbor Act of July 24, 1946, as amended are hereby further amended to provide for the incorporation of the two plans into a single plan of development: *Provided*, That authorizations heretofore, herein, and hereafter made available for the Arkansas River Basin shall be applicable to the combined plan of development.

There is hereby authorized to be appropriated the sum of $94,000,000 for prosecution of the combined plan of development for the Arkansas River Basin as herein authorized.

MISSOURI RIVER BASIN

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $132,000,000 for the prosecution of the comprehensive plan for the Missouri River Basin approved in the Act of June 28, 1938, as amended, and supplemented by subsequent Acts of Congress.

OHIO RIVER BASIN

The project for flood protection on Connoquenessing Creek at Butler, Pennsylvania, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 110, Eighty-sixth Congress, at an estimated cost of $1,558,700.

The project for the North Fork Reservoir on the North Fork of Pound River, Virginia, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 184, Eighty-sixth Congress, at an estimated cost of $3,681,000.

GREAT LAKES BASIN

The project for flood protection on Cayuga Inlet at and in the vicinity of Ithaca, New York, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 204, Eighty-sixth Congress, at an estimated cost of $3,950,000.

The project for flood protection on Smokes Creek at and in the vicinity of Lackawanna, New York, is hereby authorized substantially as recommended by Chief of Engineers in House Document Numbered 200, Eighty-sixth Congress, at an estimated cost of $1,974,000.

MOJAVE RIVER BASIN

The plan for flood control on the Mojave River, California, is hereby authorized substantially in accordance with the recommendations of the Chief of Engineers in House Document Numbered 164, Eighty-sixth Congress, at an estimated cost of $3,070,000.

LOS ANGELES RIVER BASIN

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $30,000,000 for the prosecution of the comprehensive plan approved in the Act of August 18, 1941, as amended and supplemented by subsequent Acts of Congress.

WALNUT CREEK BASIN

The plan for flood protection on Walnut Creek, California, is hereby authorized substantially as recommended by the Chief of Engineers in House Document Numbered 76, Eighty-sixth Congress, at an estimated cost of $17,980,000.

COLUMBIA RIVER BASIN

In addition to previous authorizations, there is hereby authorized to be appropriated the sum of $90,000,000 for the projects and plans for the Columbia River Basin, including the Willamette River Basin, authorized by the Flood Control Act of June 28, 1958, and subsequent Acts of Congress, including the Flood Control Acts of May 17, 1950, September 3, 1954, and July 3, 1958.

SEC. 204. The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and floods aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its Territorial possessions, which include the following-named localities: *Provided*, That after the regular or formal reports made on any survey are submitted to Congress, no supplemental or additional report or estimate shall be made unless authorized by law except that the Secretary of the Army may cause a review of any examination or survey to be made and a report thereon submitted to Congress if such review is required by the national defense or by changed physical or economic conditions: *Provided further*, That the Government shall not be deemed to have entered upon any project for the improvement of any waterway or harbor mentioned in this title until the project for the proposed work shall have been adopted by law:

Phillippi Creek, Florida.

SEC. 205. Title II of the Act may be cited as the "Flood Control Act of 1959".

Passed the House of Representatives July 16, 1959.

Attest: RALPH R. ROBERTS, *Clerk.*

[S. 1902, 86th Cong., 1st sess.]

A BILL Authorizing additional appropriations for prosecution of projects in certain comprehensive river basin plans for flood control, navigation, and other purposes

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That, in addition to previous authorizations, there are hereby authorized to be appropriated the following sums to provide for prosecution of river basin comprehensive plans under the jurisdiction of the Department of the Army, approved by previous Acts of Congress:

Name of basin	Basic approving act of Congress	Additional amount authorized to be appropriated
Arkansas River, flood control	June 28, 1938	$58,000,000
Arkansas River, multiple purpose	July 24, 1946	125,000,000
Brazos River, Tex	Sept. 3, 1954	21,000,000
Central and southern Florida	June 30, 1948	17,000,000
Columbia River	June 28, 1938	139,000,000
Los Angeles River	June 22, 1936	50,000,000
Missouri River	June 28, 1938	259,000,000
Ohio River	June 22, 1936	3,000,000
Santa Ana River, Calif	do	2,000,000
Upper Mississippi River	June 28, 1938	21,000,000
White River	do	51,000,000

SEC. 2. In addition to previous authorizations there is hereby authorized the completion of the Barkley Dam project in Kentucky, authorized by the River and Harbor Act of September 3, 1954, at an estimated additional cost of $146,000,000.

SEC. 3. The general comprehensive plan for flood control and other purposes for the Arkansas River Basin, approved by the Act of June 28, 1938, as amended, and the multiple-purpose plan for the Arkansas River and tributaries, Arkansas and Oklahoma, approved by the River and Harbor Act of July 24, 1946, as amended, are hereby further amended to provide for the incorporation of the two plans into a single plan of development: *Provided*, That authorizations heretofore, herein, and hereafter made available for the Arkansas River Basin plans shall be applicable to the combined plan of development.

Senator KERR. For the record, I place a table showing the projects included in the bill by the House. I would like the table to show each project by name, document number, type, plan of improvement, estimated cost, and benefit-cost ratio. Certain projects were added by the House on the floor. Later on we will want an explanation of each project that was not included in the House hearings, but was added on the floor, in order that we may have the record complete on them. Also we would like to have for the record a sheet on each project showing the information called for by Senate Resolution 148, 85th Congress, adopted January 28, 1958. We would like to have a tabulation of projects which you have recommended which are not in the House bill, those which are before the Congress with the budget and with the States.

(The tables referred to follow:)

Navigation and beach erosion projects in title I of H.R. 7634 as passed by House of Representatives on July 16, 1959

Navigation and beach erosion projects in title I of H.R. 7634 as passed by House of Representatives on July 16, 1959

PROJECTS REPORTED BY HOUSE PUBLIC WORKS COMMITTEE

Report	Document No.	Type	Plan of improvement	Estimated Federal cost	Project economics		
					Annual charges	Annual benefits	Benefit-cost ratio
Southwest Harbor, Maine	H. 408-85	Navigation	Small-craft anchorage areas	$240,000	$12,100	$35,900	3.0
Stonington Harbor, Maine	H. 36-86	do	Anchorage area	198,000	10,300	20,100	1.9
Cotuit Harbor, Mass	H. 142-86	do	Channel deepening and widening	320,000	53,700	61,210	1.1
Moriches and Shinnecock Inlets, N.Y	H. 126-86	do	Stabilizing of inlets, channel deepening and widening:				
			Moriches Inlet	3,331,000	404,400	709,100	1.8
			Shinnecock Inlet	3,527,000	390,300	817,500	2.1
Shem Creek, S.C	H. 35-86	do	Channel maintenance	(1)	3,530	5,900	1.67
Pascagoula Harbor, Miss	H. 98-86	do	Maintenance of:				
			Bayou Casotte Channel	0	155,500	1,003,800	6.5
			Dog River	0	1,000	3,200	3.20
Everglades Harbor, Fla	H. 147-86	do	Channel deepening and widening	117,200	17,500	21,700	1.2
Miami Harbor, Fla	S. 71-85	do	Deletion of Virginia and Dinner Keys developments and widening of ship channel and provision of turning basin.	3,818,000	251,600	510,000	2.03
Bayou Lafourche, La	H. 112-86	do	Auxiliary channel	4,664,000	312,000	444,800	1.4
			Navigation channel				
Bayous Petit Anse, etc., La	S. 70-85	do	Anchorage area	41,000	11,440	26,300	2.3
			Deepening and widening	65,000	9,430	20,000	2.1
Port Mansfield, Tex	S. 11-86	do	Channel improvements: Shrimp-boat basin; small-craft basin.	3,431,000	293,000	316,000	1.1
Mississippi River at Dubuque, Iowa	H. 56-86	do	9-feet commercial harbor	38,000	8,300	73,250	8.83
Red Wing Harbor, Minn	H. 32-86	do	Deepening and widening	170,400	9,070	12,460	1.37
Menominee Harbor, Mich	H. 113-86	do	Channel deepening and widening	715,000	32,000	35,300	1.1
Kewaunee Harbor, Wis	S. 19-86	do	Deepening, widening	66,400	4,000	4,700	1.2
			Enlargement of turning basin	15,500	1,200	10,500	8.8
Kahului Harbor, T.H	H. 109-86	do	do	944,500	47,200	135,200	2.9
Two Harbors, Minn	H. 146-86	do	Deepening to 28 and 30 feet	162,000	8,000	543,000	68.0
Duluth-Superior Harbor, Minn. and Wis	H. 150-86	do	Channel deepening	2,364,000	91,800	1,775,000	19.3
Ashland Harbor, Wis	H. 165-86	do	Breakwater and deepening and widening	1,495,000	65,400	168,800	2.6
Presque Isle Harbor, Mich	H. 145-86	do	Channel deepening and widening	215,300	8,930	230,800	25.8
Marquette Harbor, Mich	H. 154-86	do	Channel deepening	236,000	9,200	23,700	2.6
Calumet Harbor, Ind	H. 149-86	do	do	5,240,000	192,400	1,328,500	6.9
Toledo Harbor, Ohio	H. 153-86	do	Channel deepening and widening	14,684,000	601,100	668,000	1.1
Sandusky Harbor, Ohio	H. 144-86	do	do	5,800,000	263,900	1,006,500	3.8
Cleveland Harbor, Ohio	H. 152-86	do	Deepening and widening	2,486,000	272,300	1,235,700	4.5
Lorain Harbor, Ohio	H. 166-86	do	Breakwater construction, channel	19,323,000	881,300	1,226,700	1.4
Ashtabula Harbor, Ohio	H. 148-86	do	Channel deepening and widening	4,077,000	210,400	877,900	4.2

[1] Maintenance only.

Navigation and beach erosion projects in title I of H.R. 7634 as passed by House of Representatives on July 16, 1959—Continued

PROJECTS REPORTED BY HOUSE PUBLIC WORKS COMMITTEE—Continued

Report	Document No.	Type	Plan of improvement	Estimated Federal cost	Project economics		
					Annual charges	Annual benefits	Benefit-cost ratio
Buffalo Harbor, N.Y.	H. 151–86	Navigation	Deepening and widening	$2,352,000	$180,000	$725,000	4.0
Kingstown and Westerly, R.I.	H. 30–86	Beach erosion	Restoration and stabilization of shores:				
			Matunuck Beach	94,300	54,000	75,000	1.4
			Misquamicut Beach	46,000	18,200	88,200	4.8
Key West, Fla.	H. 413–85	do	Provision of a protective and recreational beach	231,200	76,360	198,000	2.6
Total				80,507,800			
Barkley Dam, Ky.: Additional monetary authorization for completion.				146,000,000			
Subtotal				226,507,800			

PROJECTS INCLUDED BY COMMITTEE AMENDMENT ON HOUSE FLOOR

South Bristol Harbor, Maine	S. 30–86	Navigation	Channel deepening to 5 feet	$97,000	$4,500	$7,000	1.6
Wells Harbor, Maine	H. 202–86	do	Channel and anchorage area	340,000	27,400	27,580	1.0
Apponaug Cove, R.I.	H. 143–86	do	Channel deepening and widening	180,000	22,600	55,000	2.4
Gulf coast shrimp boats	H. 183–86	do	Small-boat harbors:				
			Fort Myers	165,800	29,000	57,200	2.0
			Naples	237,200	54,300	76,100	1.4
Bakers Haulover Inlet, Fla.	H. 189–86	do	Channel improvements	239,000	29,200	94,000	3.2
Duluth-Superior Harbor (2d interim)	H. 196–86	do	Channel deepening	2,513,000	115,500	1,074,000	9.3
Indiana Harbor, Ind.	H. 195–86	do	do	974,000	37,200	1,012,000	27.0
Erie Harbor, Pa.	H. 190–86	do	do	1,729,000	88,000	111,000	1.3
Subtotal				6,445,000			
Grand total, title I				232,952,800			

Flood control projects in title II of H.R. 7634 as passed by House of Representatives

PROJECTS REPORTED BY HOUSE PUBLIC WORKS COMMITTEE

Flood control projects in title II of H.R. 7634 as passed by House of Representatives

PROJECTS REPORTED BY HOUSE PUBLIC WORKS COMMITTEE

Report	Document No.	Type	Plan of improvement	Estimated Federal cost	Project economics		
					Annual charges	Annual benefits	Benefit-cost ratio
Blackstone River, R.I.	S. 87-85	Flood control	Levees, floodwalls, and channel improvements	$2,970,000	$167,800	$235,000	1.4
Waxahachie Creek, Bardwell Reservoir, Tex.	H. 424-85	Flood control and watershed.	Multiple-purpose reservoir	5,104,000	290,500	318,750	1.10
Blieders Creek, Tex.	H. 180-86	Flood control	Reservoir	1,060,000	45,900	108,900	2.4
Connoquenessing Creek at Butler, Pa.	H. 110-86	do	Channel enlargement	1,558,700	80,100	235,000	2.9
Big Sandy River Basin (North Fork Reservoir, Va.).	H. 184-86	do	Flood control reservoir	3,681,000	155,000	245,000	1.58
Mojave River, Calif.	H. 164-86	do	do	3,070,000	129,700	241,000	1.86
Walnut Creek, Calif.	H. 76-86	do	Channel improvements and levees	17,980,000	985,000	1,282,000	1.30
Total				35,423,700			

PROJECTS INCLUDED BY COMMITTEE AMENDMENT ON HOUSE FLOOR

Quinebaug River, Conn. and Mass.	S. 41-86	Flood control	Construction of West Thompson Reservoir	$4,010,000	$176,200	$229,000	1.3
Cayuga Inlet, Ithaca, N.Y.	H. 204-86	do	Channel improvement and levee	3,950,000	243,200	282,300	1.2
Smokes Creek, vicinity of Lackawanna, N.Y.	H. 200-86	do	Channel improvement	1,974,000	103,100	127,600	1.2
Total				9,934,000			
Subtotal				45,357,700			

Increased basin authorizations included in title II to cover a period of 2 years (fiscal years 1961–62)

River basins	Available monetary authorization	Proposed and actual funding through fiscal year 1962	Deficit monetary authorization	Additional monetary authorization required
Arkansas:				
Flood control [1]	$224,773,000	$258,865,800	−$34,092,800	$35,000,000
Navigation [1]	136,000,000	194,882,000	−58,882,000	59,000,000
Central and southern Florida	83,300,000	84,122,000	−822,000	1,000,000
Columbia	575,300,000	664,446,700	−89,146,700	90,000,000
Los Angeles	254,041,000	283,620,000	−29,579,000	30,000,000
Missouri	1,039,094,000	1,170,402,100	−131,308,100	132,000,000
White	226,000,000	257,982,200	−31,982,200	32,000,000
Total additional authorization required for 2-year period				379,000,000
Grand total, title II				424,357,700
Grand total, House bill				657,310,500

[1] Authorizations combined for administrative ease of handling.

Survey reports favorably recommended by the Chief of Engineers

REPORTS WITH CONGRESS NOT IN OMNIBUS BILL

Report	Document No.	Type	Plan of improvement	Estimated Federal cost	Project economics		
					Annual charges	Annual benefits	Benefit-cost ratio
Illinois Waterway, Ill. and Ind.	H. 31–86	Navigation	Supplemental locks	$114, 652, 000	$4, 594, 300	$22, 320, 000	4. 9
Tahchevah Creek, Calif.	H. 171–86	Flood control	Reservoir and channel improvement	1, 658, 000	85, 500	100, 700	1. 18
New Jersey, Barnegat Inlet to Comp May Canal	H. 208–86	Beach erosion	Restoration and protection of shore at 7 locations:				
			Barnegat Light	98, 600	29, 000	121, 000	4. 2
			Long Beach Island	240, 700	578, 000	990, 000	1. 7
			Ventnor, Margate, and Longport	59, 700	58, 000	92, 000	1. 6
			Stone Harbor	82, 000	46, 000	244, 000	5. 3
			North Wildwood	11, 000	22, 000	135, 000	6. 1
			Ocean City	813, 000	291, 000	1, 167, 000	3. 7
			Cape May City	408, 400	143, 000	275, 000	1. 8
Pawcatuck, Conn.	H. 212–86	Harbor and flood control.	Floodwall, dikes	409, 000	27, 000	57, 400	2. 1
Stamford, Conn.	H. 210–86	do	Barrier, dikes, and walls	3, 030, 000	248, 000	363, 000	1. 5
East Basin of Mamaroneck Harbor, N.Y.	H. 209–86	Navigation	Anchorage area	105, 000	10, 400	53, 300	5. 1
Total				121, 567, 400			

REPORTS WITH BUDGET

Nicodemus Slough, Fla.		Flood control	Canal and levee	$318, 000	$22, 600	$25, 900	1. 15
McKinney Bayou, Ark.		do	Channel improvement and levee	346, 400	26, 700	51, 100	1. 9
Monterey Bay, Calif.		Navigation	Breakwater	3, 989, 000	260, 000	469, 000	1. 8
Noyo Harbor, Calif.		do	Channel improvements	370, 000	18, 440	50, 450	2. 7
Palm Beach Harbor, Fla. (Lake Worth Inlet)		do	Channel deepening and widening	4, 980, 000	201, 000	276, 300	1. 4
Jordan River, Utah		Flood control	Flood control and water supply reservoir	3, 851, 000	358, 000	341, 000	1. 3
Total				13, 854, 400			

Survey reports favorably recommended by the Cheif of Engineers—Continued

REPORTS WITH STATE AND FEDERAL AGENCIES

Report	Document No.	Type	Plan of improvement	Estimated Federal cost	Project economics		
					Annual charges	Annual benefits	Benefit-cost ratio
Village Creek, Ark.		Flood control	Channel clearing and construction	$294,000	$29,210	$52,140	1.8
Cheyenne River, S. Dak. and Wyo.		do	Levees, channel improvement	272,000	15,035	19,100	1.3
Pemberton Point and Cape Cod, Mass.		Beach erosion	Beach improvements at 3 locations:				
			North Scituate	53,000	10,100	18,550	1.8
			Brant Rock	49,300	9,800	19,700	2.0
			Plymouth Town Beach	37,000	8,800	11,545	1.3
Gila and Salt Rivers, Ariz.		Flood control	Levees and channel	3,300,000	178,900	354,000	2.0
Naugatuck River, Conn.		do	4 flood control reservoirs	10,230,000	416,800	763,000	1.8
Maniece Bayou, Ark.		do	Channel improvements, levees	668,400	54,000	75,000	1.4
Biloxi Harbor, Miss.		Navigation	Channel deepening and widening	326,000	35,800	43,500	1.2
St. Marks River, Fla.		do	do	1,711,000	63,000	139,000	2.2
Little Pass, Fla.		do	Channel improvements	104,000	67,000	107,300	1.6
Total				17,044,700			
Grand total				152,466,500			

The following project writeups submitted by the Chief of Engineers contain information called for by Senate Resolution 148, 85th Congress, adopted January 28, 1958:

PROJECTS IN TITLE I

Southwest Harbor, Maine

(H. Doc. 408, 85th Cong.)

1. *Navigation problem.*—Southwest Harbor, a small cove on the easterly side of the westerly neck of Mount Desert Island, is exposed to storms and waves from the east. The available sheltered areas are badly congested during storms, some boats must anchor in exposed areas, and considerable damage has occurred to boats and fishing gear. Average annual damage to commercial fishing boats is estimated at $10,000. In 1954, about 7,500 tons of fish and shellfish were landed at Southwest Harbor. Lack of safety requires some vessels using the nearby productive fishing grounds to run to other bases. Annual vessel trips are estimated at 40,000.

2. *Considered solutions.*—Enlarged anchorage areas near the northern shore of Southwest Harbor and a breakwater extending south from Clark Point near the eastern end were considered. The breakwater plan was discarded because of probable obstruction to outflow of ice on the tide, which now makes the harbor relatively ice-free.

3. *Plan of improvement.*—The proposed plan of improvement would provide for dredging two adjoining anchorage areas of 5 acres each westerly of Clark Point, the inner, or westerly, area to a depth of 6 feet, and the outer, or easterly, area to a depth of 10 feet below mean low water, subject to the conditions of local cooperation stated in paragraph 4, below. Estimated first costs, annual costs, and annual benefits, based on March 1957 prices, a 50-year project life, and an interest rate of 2½ percent, are as follows:

	Federal	Non-Federal	Total
Estimated first costs:			
Federal			$240,000
Non-Federal, dredging and pier			30,000
Non-Federal, cash contribution			10,000
Total			280,000
Estimated annual costs:			
Interest and amortization	$8,500	$1,400	9,900
Maintenance	2,000	200	2,200
Total	10,500	1,600	12,100
Estimated annual benefits:			
Commercial fishing			33,200
Recreational			2,700
Total			35,900
Benefit-cost ratio			3.0

4. *Apportionment of costs and local cooperation.*—Local interests would be required to contribute 4 percent of the construction costs of the project in recognition of the recreational benefits expected, which are considered equally local and general. The recommended requirements are:

(*a*) Contribute in cash 4 percent of the cost of the work, presently estimated at $10,000, to be paid in a lump sum prior to commencement of construction, the final allocation of cost to be made after the actual costs have been determined;

(*b*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction of the improvement;

(*c*) Hold and save the United States free from damages due to the construction and maintenance of the project;

(*d*) Provide and maintain an adequate public landing suitably situated with respect to the 6-foot anchorage area and open to all on equal terms; and

(*e*) Provide and maintain depths in access channels and berthing areas at

the public terminals commensurate with the depths provided in the related project areas.

5. *Discussion.*—Analysis on the basis of a 100-year life and 2½ percent interest rate would increase the benefit-cost ratio slightly, assuming no change in the cost of maintenance over the longer period. The project is considered amply justified on the basis of studies and criteria in the report. Proposed local cooperation is consistent with other similar projects.

Stonington Harbor, Maine

(H. Doc. 36, 86th Cong.)

1. *Navigation problem.*—Stonington Harbor, Maine, is on the southern tip of Deer Isle in the eastern part of Penobscot Bay. The harbor consists of several small coves along a 2.5-mile stretch of the southern shore of Deer Isle. The main cove, extending 1,200 feet inland between Staple Point and Greens Head, is 2,100 feet wide. It has a maximum depth of 18 feet. Allen Cove is about 2,200 feet west of the main cove It is about 600 feet wide and 1,800 feet long, lying between Deer Isle and Moose Island, with depths ranging up to 7 feet. Stonington Harbor is exposed to the southeast but partial protection from the ocean is afforded by Crotch Island to the south and numerous other nearby islands. There is no Federal project in the harbor. Deer Island Thorofare is the main approach. A Federal project for the thorofare, completed in 1915, provides for removal of rock to a depth of 15 feet over an 800- by 300-foot area. The mean range of tide in the harbor is 9.7 feet.

2. The immediate tributary area is within the town of Stonington which extends over the southern part of Deer Isle and the adjacent islands to the south and east. The village of Stonington borders on the central cove of the harbor. In 1950 it had a population of 1,657. The primary local industries are commercial fishing; fish processing; boat building, repairing, and servicing; and granite quarrying on Crotch Island. Stonington is also a supply base for Isle Au Haut and other adjacent islands. Waterborne commerce averaged about 14,000 tons annually from 1943 through 1955 consisting mainly of granite, fish and fish products, petroleum products, pulpwood, and miscellaneous commodities. Annual vessel traffic is estimated to average between 60,000 and 70,000 trips, consisting mainly of commercial fishing boats, small tankers, mail and passenger boats, and barges of less than 8-foot draft.

3. Local interests have requested that five areas be dredged, each to a depth of 8 feet or to ledge rock if encountered at a lesser depth: (*a*) Allen Cove; (*b*) two locations in the central cove, one east of Greens Head and the second west of Staple Point; (*c*) an area west of the R. K. Barter Canneries wharf; and (*d*) an area adjacent to the Stonington Lobster Cooperative Wharf. They stated that these improvements would eliminate delays and congestion in small-craft operations in the vicinity of commercial wharves and would reduce storm damages by eliminating the necessity for mooring in exposed areas on the edge of Deer Island Thorofare.

4. *Improvements considered.*—The improvements requested by local interests have been considered. The area west of the R. K. Barter Canneries wharf has sufficient depth except where protruding ledge rock exists. General improvement to the requested 8-foot depth does not appear to be necessary to serve a substantial majority of the vessels using the harbor. Also, extensive ledge rock in the coves would restrict anchorage areas to sizes smaller than those requested by local interests. In view of these conditions a modified plan of improvement was investigated and recommended.

5. *Recommended improvement.*—The recommended improvement provides for an anchorage 650 feet long and 300 feet wide in Allen Cove dredged to a depth of 6 feet below mean low water; an anchorage 700 feet long and 330 feet wide adjacent to Greens Head to a depth of 6 feet; and an anchorage 400 feet long and 200 feet wide adjacent to Staple Point to a depth of 8 feet. These measures will make available sorely needed anchorage areas for local and transient vessels, provide a more adequate harbor of refuge for small craft in the area, relieve congestion in the terminal area, and provide sufficient depth of water in protected areas of the harbor to make practical the construction of public landings.

6. *First cost.*—The estimated first cost of the recommended improvement, based on prices and conditions existing in 1957, is as follows:

Federal	$198,000
Non-Federal	[1] 22,000
Total	220,000

[1] Cash contribution. Non-Federal costs for construction of public landings and dredging of berths are considered to be self-liquidating costs and are not included in the project estimate.

7. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$7,000	$800	$7,800
Maintenance	2,500		2,500
Total	9,500	800	10,300
Average annual benefits:			
Reduction in boat damage			5,000
Reduction in vessel operating costs			11,300
Harbor of refuge benefits			2,000
Recreational boat benefits			1,800
Total			20,100
Ratio of benefits to costs			2.0

8. *Apportionment of costs.*—The costs of the recommended improvement are apportioned between the Federal Government and local interests in accordance with normal procedure for projects of this type. Local interests are expected to (*a*) contribute in cash 10 percent of the cost of construction, presently estimated at $22,000, to be paid either in a lump sum prior to commencement of construction or in installments prior to commencement of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, the final allocation of cost to be made after actual costs have been determined; (b) furnish without cost to the United States all lands, easements, and right-of-way necessary for the construction and subsequent maintenance of the improvement, when and as required; (*c*) hold and save the United States free from damages due to the construction and maintenance of the improvement; and (*d*) provide and maintain public landings with suitable supply facilities and adequate berths in Allen Cove and near the anchorage adjacent to Staple Point, open to all on equal terms. The cash contribution required is based upon the relationship between local and general benefits to be effected by the recommended improvement.

9. *Discussion.*—The measures recommended provide a logical and economically feasible means of meeting needs for improved navigation conditions in Stonington Harbor. Analysis on the basis of an economic life of 100 years or other alternative basis would not result in modification of this finding.

South Bristol Harbor, Maine

(S. Doc. 30, 86th Cong.)

1. *Project description and economic life.*—South Bristol Harbor is located between Rutherford Island and the mainland in the water passage called the Gut. This harbor is about 40 miles northeast of Portland and 28 miles southwest of Rockland, Maine. The existing project approved in 1912 and completed in 1914 provides for a channel 2 feet deep at mean low water from the western approach through the swing bridge and into the channel to the east. Local interests desire a depth of 7 feet in the channel through the swing bridge and approaches thereto, placement of a permanent marker on a ledge outcropping on the southern edge of the west approach channel to the bridge, and removal of shoals on

the north side of the east approach channel. The considered improvement consists of a channel 5 feet deep at mean low water, 50 feet wide in the western and eastern approaches, and 25 feet wide through the bridge; removal of the isolated shoal areas on the north side of the east approach channel; and the establishment of a navigation marker on the ledge outcropping on the south side of the west channel opposite the Gamage Rock. The improvement would eliminate tidal delays for commercial fishing boats at the Gut going to the commercial wharves in the eastern half of the harbor and in addition permit increased passages by recreational small craft using the inland waterway, of which the Gut is a part. A dredging project of this nature is considered to have a project life of 50 years.

2. *Project costs.*—First costs are based on prices and conditions as of July 1957. Annual costs are based on maintenance experience for work of this nature, an economic life of 50 years, and an interest rate of 2.5 percent.

(*a*) First cost:	
Federal	[1] $108,500
Local	[2] 5,000
Total	113,500
(*b*) Annual cost:	
Interest and amortization	4,000
Maintenance [3]	500
Total	4,500

[1] Includes cost of $10,000 already incurred for preauthorization studies and $1,500 for navigation aids.
[2] Includes cash contribution of $3,000 and $2,000 for cable relocation.
[3] Maintenance is a Federal responsibility.

3. *Benefit-cost ratio.*—The report evaluates average annual tangible benefits of $7,000, consisting of savings in operating costs for commercial fishing vessels and recreational craft and reflecting an adjustment for increased bridge and vehicular operation costs resulting from increased bridge openings. The benefit-cost ratio is 1.6 based on a 50-year project life. Analysis on the basis of a longer economic life would be conjectural and would not influence selection of facilities to serve present and prospective needs.

4. *Intangible project effects.*—The value of the harbor as a harbor of refuge for the protection of life and property would be increased after improvement, as the eastern part of the harbor is one of the most protected anchorages along the Maine coast. The improved harbor also would be a more desirable port of call for fishing vessels with resultant benefit to the local economy.

5. *Physical feasibility and cost of providing for future needs.*—All reasonably prospective future needs for navigation would be met by the improvements recommended.

6. *Allocation of costs.*—Navigation is the only purpose served by the improvement, and all project costs apply to this purpose.

7. *Apportionment of costs.*—The costs of the recommended improvement are apportioned between the Federal Government and local interests in accordance with normal procedures for projects of this type. Local interests are expected to contribute in cash 3 percent of the cost of construction, the cash contribution presently estimated at $3,000. This requirement is computed on the basis of recreational boating benefits which are considered to be half general and half local in nature.

8. *Extent of interest in project.*—Local interests, officials of the town of South Bristol, and representatives of State agencies appeared at the public hearing and voiced a unanimous appeal for the desired improvement.

9. *Repayment schedules.*—Local interests have been consulted and they have indicated that necessary assurances to make a lump-sum cash contribution of $3,000 would be furnished when requested.

10. *Effect of project on State and local government.*—No additional governmental services would be required as a result of construction of the project. Increased local taxes might be required to amortize the cost of a local cash contribution to the Federal project. Increased local tax revenue may result from increased property values in the area. The net change is considered to be very small.

WELLS HARBOR, MAINE

(H. Doc. 202, 86th Cong.)

1. *Navigation problem.*—Wells Harbor is located in York County in the town of Wells, at the mouth of the Webhannet River, about 20 miles northeast of Portsmouth Harbor, N.H., and about 34 miles southwest of Portland Harbor, Maine. The nearest adjacent developed waterways are at Kennebunk River, 4.5 miles to the north and Josias River about 6 miles south. The Webhannet River is a shallow winding stream which extends about 4 miles inland from the coast. Its lower 2 miles flow through the marshes behind Wells Beach. The entrance to the river between the end of Wells Beach and Drakes Island is shallow and is exposed to the open water in an easterly direction. The existing Federal project for Wells Harbor was adopted in 1872. It provides for repairs to an old Government pier made of cribwork ballasted with stone extending seaward from Drakes Island. No work has been done on the project since 1873 and at the present time only the piling of the pier remains.

2. The town of Wells is a highly developed summer resort area which in 1950 had a permanent population of 2,321. The principal occupations of the permanent residents are fishing, farming, and catering to the needs of summer residents and tourists. The town contains many auto courts, motels, hotels, gift shops, and restaurants. There is a large colony of summer cottages at Wells Beach, another at adjacent Moody Beach to the south and a smaller colony at Drakes Island. Hotels and cottages reportedly can accommodate 20,000 to 25,000 people and the summer population increase is conservatively estimated at over 20,000. About 70 percent of the town income is derived from summer industry. Fifty-five percent of the town's evaluated property is owned by nonresidents.

3. At the present time, there are no safe adequate channels or anchorage areas in Wells Harbor. Since the economy of the town is highly dependent upon summer resort trade, local interests desire improvement of the harbor to permit development of recreational boating and sport fishing in the area. Existing improved harbors along the coast adjacent to Wells Harbor are overcrowded and it is reported that the crowded conditions in other harbors make it practically impossible for transient craft to obtain mooring space. The general need for harbor space indicates that if an adequate harbor is developed in the Webhannet River it will be used by existing fishing and recreational craft which will be transferred from adjacent harbors, by new boats, and by transient craft which now have difficulty in obtaining accommodations elsewhere along the coast.

4. A bar at the mouth of the Webhannet River with a controlling depth of approximately 1.5 feet prevents entrance to Wells Harbor except at higher stages of the tide. Within the harbor, the natural channel is narrow and shallow between low sand and marsh flats. There are no facilities of any type for boats which can enter the harbor.

5. The improvement desired by local interests consists of an entrance channel across the sandbar at the mouth of the harbor and an anchorage in the harbor of a depth and area to accommodate a potential fishing and recreational fleet. The Wells Harbor committee has stated that mooring space for 300 craft is desirable and, if possible, the harbor should be able to accommodate at least 200 craft. The committee has expressed its desire for harbor development with a proposed public landing to be located in accordance with the following order of preference:

(*a*) Along the north side of Mile Road, about 7,000 feet south of the harbor entrance.

(*b*) Behind Wells Beach on the east side of the harbor.

(*c*) Along the south side of Drakes Island Road about 4,000 feet north of the harbor entrance.

6. *Improvements considered.*—All improvements desired by local interests were considered. All plans of improvement considered included two jetties at the harbor entrance 940 and 640 feet long, an entrance channel 100 feet wide and 10 or 8 feet deep, an anchorage within the harbor 8 or 6 feet deep with an area varying from 9.5 to 7.4 acres and an inner channel 100 feet wide and 8 or 6 feet deep to the anchorage and to the vicinity of a proposed public landing to be located preferably at Mile Road, secondly at the east side of the harbor on the landward side of Wells Beach, or thirdly at Drakes Island Road.

7. *Improvement recommended.*—The recommended improvement provides for an anchorage basin 7.4 acres in area and 6 feet deep; a channel 100 to 150 feet wide, extending from deep water in the Atlantic Ocean to the inner end of the basin, with the seaward section 8 feet deep, and the harbor section 6 feet deep; and 2 converging stone jetties, one extending 940 feet easterly from Wells Beach and the other 640 feet southerly from Drakes Island, separated so as to provide a clear opening 400 feet wide. These measures will make available sorely needed anchorage area for local and transient craft and provide an adequate harbor of refuge for vessels passing along the Maine coast where recreational boating and fishing is an integral and important part of the economy of the coastal towns.

8. *First costs.*—The estimated cost of the recommended improvement based on March 1958 prices is as follows:

Federal	$340,000
Non-Federal:	
Cash contribution	200,000
Lowering water pipeline	5,000
Total	[1] 545,000

[1] Exclusive of cost of $8,000 already incurred for preauthorization studies and $1,000 for navigation aids.

9. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$12,300	$7,200	$19,500
Maintenance	[1] 7,900		[1] 7,900
Total	20,200	7,200	27,400
Average annual benefits:			
Benefits to recreational navigation			17,070
Increased net value of lobster catch			8,260
Shore protection			1,000
Land enhancement			1,250
Total			27,580
Ratio of benefits to costs			1.00

[1] Includes $100 for maintenance of navigation aids.

10. *Apportionment of costs.*—The costs of the recommended improvement are apportioned between the Federal Government and local interests in accordance with normal procedure for projects of this type. Local interests are expected to (*a*) contribute in cash 37 percent of the cost of construction, and that such contribution, presently estimated at $200,000, be paid either in a lump sum prior to commencement of construction, or in installments prior to commencement of pertinent work items, in accordance with construction schedules as equired by the Chief of Engineers, the final allocation of cost to be made after actual costs have been determined; (*b*) provide without cost to the United States all lands, easements, rights-of-way, and suitable spoil-disposal areas necessary for the construction and subsequent maintenance, when and as required; (*c*) hold and save the United States free from damages due to the construction and maintenance of the project; (*d*) provide and maintain at local expense necessary mooring facilities and utilities, including a public landing with suitable supply facilities, open to all on equal terms; (*e*) construct and maintain any bulkheads required for retention of dredged material from the initial construction and subsequent maintenance; and (*f*) accomplish and maintain without expense to the United States alterations as required in sewer, water supply, drainage, and other facilities.

11. *Discussion.*—The measures recommended provide a logical and economically feasible means of meeting needs for improved navigation conditions in Wells Harbor. Analysis on the basis of an economic life of 100 years would be conjectural and would not provide a basis for modification of the recommended improvement. The cash contribution required is computed on the basis that 37 percent of the expected project benefits will be local in incidence.

COTUIT HARBOR, MASS.

(H. Doc. 142, 86th Cong.)

1. *Navigation problem.*—Navigation at Cotuit Harbor is principally recreational. The existing fleet in West and Great Bays includes about 366 craft of all types, varying from sailboats of less than 15-foot length to cruisers over 75 feet long. The fleet in Cotuit Bay and Seapuit River numbers about 166 craft with maximum sizes somewhat less than in West and Great Bays. Navigation difficulties stem primarily from inadequate depths in the narrow and winding channels. The West Bay entrance is exposed to ocean swells which ground out boats that would have adequate clearance in calm water. The channels in West Bay and Seapuit River are narrow and difficult to navigate at night or in bad weather. The channels from West Bay to Great Bay are shallow and few boats go into Great Bay for anchorage. Some local interests originally desired an improved entrance to Cotuit Bay, but later all generally agreed on consideration of improvements to the West Bay entrance, the West Bay to Great Bay Channel, Seapuit River Channel, and the Narrows Channel between Great and Cotuit Bays.

2. *Solutions considered.*—Nine alternative plans of improvement were considered in detail, varying principally in project depths from the 12 feet desired locally (plan A) for all 4 channels, through lesser depths (6 to 10 feet) for combinations of 2, 3, or 4 of the channels. The recommended plan B is described in paragraph 3. The following table summarizes estimated total first and annual costs and benefits, and benefit-cost ratios for the nine plans. Estimated first cost, annual costs and annual benefits are based on April 1958 prices, a 50-year project life and 2½ percent interest rate.

Plan	Number of channels	Miles	First costs [1]	Annual costs	Annual benefits	Benefit-cost ratios
A	4	5.2	$1,702,000	$114,300	$64,590	0.57
B [2]	3	4.2	671,000	53,700	61,210	1.14
C	2	2.6	449,000	38,710	38,380	.99
D	3	3.3	540,000	43,870	48,830	1.11
E	4	4.9	742,000	58,200	61,210	1.05
F	3	4.2	541,000	48,400	44,580	.92
G	3	4.1	331,000	35,200	13,550	.38
H	3	3.2	270,000	27,970	10,250	.37
I	4	4.7	367,000	37,800	13,550	.36

[1] Includes costs of aids to navigation and preauthorization survey.
[2] Recommended plan.

3. *Recommended plan of improvement.*—The recommended plan (plan B) would provide for an entrance channel, 10 feet deep, 150 feet wide, and 0.8 mile long, from Nantucket Sound into West Bay; a channel, 8 feet deep and 1.8 mile long, from the West Bay entrance through West Bay and the bridge at Osterville, and into Great Bay, 100 feet wide in open areas, 31 feet wide at the bridge, and 60 feet wide for 850 feet north of the bridge; and a channel, 8 feet deep, 60 feet wide, and 1.6 miles long, from the West Bay entrance through Seapuit River into Cotuit Bay. The estimated costs of plan B, exclusive of self-liquidating facilities, are as follows:

			Amount
First costs:			
Dredging			$640,000
Preauthorization survey			25,000
Aids to navigation			6,000
Total			671,000
Annual costs:	*Federal*	*Non-Federal*	
Interest and amortization	$12,300	$11,300	
Maintenance	[1] 30,100	----------	
Subtotals	42,400	11,300	
Total	53,700		
Annual benefits			$61,210
Benefit-cost ratio			1.14

[1] Includes $900 for maintenance of navigation aids.

4. *Apportionment of costs.*—The benefits from recreational navigation are considered equally general and local. Accordingly, the first costs of general navigation facilities are divided equally between Federal and non-Federal interests. Local service facilities required by the improvement are considered entirely self-liquidating and a local responsibility. The Federal Government would assume the costs of aids to navigation, preauthorization survey costs, and maintenance of the general navigation project. Thus, local interests would be required to agree to:

(*a*) Contribute in cash 50 percent of the cost of construction, and that such contribution, presently estimated at $320,000, be paid either in a lump sum prior to commencement of construction, or in installments prior to commencement of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, the final allocation of costs to be made after actual costs have been determined;

(*b*) Provide without cost to the United States all lands, easements, rights-of-way, and suitable spoil-disposal areas for the construction and subsequent maintenance of the project, when and as required;

(*c*) Hold and save the United States free from damages due to the construction and maintenance of the project;

(*d*) Provide and maintain two suitable public landings or wharves with adequate berths in accordance with plans approved by the Chief of Engineers, open to all on equal terms; and

(*e*) Maintain the jetties at the entrance to West Bay.

5. *Discussion.*—Analysis of the recommended and alternative plans on the basis of a 100-year life and 2½ percent interest rate would increase the benefit-cost ratios slightly but would not change the relative order of merit of the plans. Plan B would still have the highest benefit-cost ratio and the greatest excess of benefits over costs. Officials of the Commonwealth of Massachusetts and the town of Barnstable have provided reasonable assurances of local cooperation for plan B, the most favorable plan.

Apponaug Cove, R.I.

(H. Doc. 143, 86th Cong.)

1. *Navigation problem.*—Apponaug Cove, a northwest arm of Greenwich Bay, is in Warwick, R.I. The cove, which is divided into areas known as the outer, middle, and inner basins, is about 1 mile long with widths varying from 100 to 1,600 feet and depths ranging up to 8 feet. There is no Federal navigation project in the cove. Local interests have built a number of wharves, a public landing, and other navigation facilities including a small-boat launching ramp.

2. The cove is used by fishermen who serve four wholesale fish terminals in the harbor, and by owners of local and transient recreational craft. Local interests desire a channel 100 feet wide from Greenwich Bay to the upper end of the cove, and anchorages in the middle and inner basins, all with depths suitable for small craft; and spoil disposal in a manner to create land suitable for commercial development. They claim that these improvements would provide desirable accommodations for the present and prospective fishing and recreational fleets, and would eliminate some objectionable tidal flats. They indicate their willingness and ability to meet the requirements of local cooperation.

3. *Recommended improvement.*—The recommended improvement of Apponaug Cove provides for a channel 100 feet wide and 6 feet deep from that depth in Greenwich Bay to a point at the head of the middle basin 200 feet east of the New York, New Haven, & Hartford Railroad bridge, and a 10-acre anchorage basin, 6 feet deep, southwest of the channel in the middle basin; generally in accordance with the plans of the division engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost of $300,000 for construction and $11,300 annually for maintenance; provided that, prior to construction, local interests agree to (*a*) contribute in cash 40 percent of the cost of construction, and that such contribution, presently estimated at $120,000, be paid in a lump sum prior to commencement of construction, the final allocation of cost to be made after actual costs have been determined; (*b*) provide without cost to the United States all lands, easements, rights-of-way, and suitable spoil-disposal areas for the construction and subsequent maintenance of the project, when and as required; (*c*) hold and save the United States free from damages due to the construction and maintenance of the project; and (*d*) provide and maintain a suitable public landing with adequate supply facilities, in accordance with plans approved by the Chief of Engineers, and the necessary mooring

facilities in the anchorage area, the landing and mooring facilities to be open to all on equal terms. The net cost to the United States for the recommended plan of improvement is estimated at $180,000 for construction and $11,300 annually for maintenance.

4. *First cost.*—The estimated first cost of the recommended project given above is based on prices and conditions existing in 1958. Preauthorization study costs of $7,000 and $3,000 for navigation aids are not included in the figures given.

5. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$6,700	$4,200	$10,900
Maintenance	11,700	0	11,700
Total	18,400	4,200	22,600
Average annual benefits:			
Commercial fishing			12,000
Recreational boating			38,000
Land enhancement			5,000
Total			55,000
Ratio of benefits to costs			2.4

Alternative analysis on the basis of an economic life of 100 years would be conjectural and has not been made. Such analysis would not provide a basis for alternative choice of facilities to serve present and prospective needs at Apponaug Cove.

6. *Apportionment of costs.*—The recommended conditions of local cooperation stated above are in accordance with normal procedures for navigation projects of this type. The required contribution of 40 percent of the cost of construction was determined on the basis that total project benefits are 40 percent local in nature. In arriving at this figure commercial fishing benefits were considered to be general in nature and recreational boating and land enhancement benefits were considered to be half general and half local.

7. *Discussion.*—Consideration was given to Federal improvement of the inner basin. Local interests stated that the demands for adequate mooring space and the rate of growth of boating in the area require the larger mooring area possible with Federal improvement of the middle basin. They recognize development of the inner basin as a responsibility of the city of Warwick. The recommended improvement comprises a logical and economically justified means of meeting present and prospective navigation requirements at Apponaug Cove. Local interests have indicated their willingness and ability to meet the local cooperation requirements.

Moriches and Shinnecock Inlets, Long Island, N.Y.

(H. Doc. 126, 86th Cong.)

1. *Plan of improvement.*—Local interests have requested stabilization of Moriches and Shinnecock Inlets by construction of entrance jetties and dredging of navigable channels. They have performed some dredging and have constructed revetments and short jetties at each location. These works have served to prevent migration of the inlets, and have provided openings which permit small boat navigation with difficulty and limited tidal exchange of ocean and bay waters. They are not adequate for permanent inlet stabilization and safe navigation. Moreover, recent storms have damaged the locally provided jetties and, unless further improved, the inlets will close or become too shoal to be of use. The measures recommended for improvement of Moriches and Shinnecock Inlets are as follows:

(a) *Moriches Inlet.*—Provision of an entrance channel 10 feet deep and 200 feet wide, from that depth in the Atlantic Ocean to Moriches Bay, thence an inner channel 6 feet deep and 100 feet wide to the Long Island Intracoastal Waterway, rehabilitation of existing jetties and revetments, seaward extension of the east

jetty to the 12-foot contour, seaward extension of the west jetty about 400 feet, and construction of a fixed bypassing facility to transfer sand from the east side of the inlet to the west side.

(*b*) *Shinnecock Inlet.*—Provision of an entrance channel 10 feet deep and 200 feet wide, from that depth in the Atlantic Ocean to Shinnecock Bay, thence an inner channel 6 feet deep and 100 feet wide to the Long Island Intracoastal Waterway, rehabilitation of existing jetties and revetments, seaward extension of the east jetty to the 12-foot contour, seaward extension of the west jetty about 900 feet, and construction of a fixed bypassing facility to transfer sand from the east side of the inlet to the west side.

2. The recommended improvements will stabilize the inlets, stimulate offshore commercial fishing, benefit recreational boating and fishing, provide needed access to harbors of refuge, contribute to the control of beach erosion, and contribute to reduction of bay pollution by improving tidal flows.

3. *First costs.*—The estimated first costs of the recommended improvements, based on prices and conditions as of 1957, are as follows:

Item	Moriches Inlet	Shinnecock Inlet	Total
Federal	$3,331,000	$3,527,000	$6,858,000
Non-Federal	2,725,000	2,071,000	4,796,000
Total	6,056,000	5,598,000	11,654,000

The first costs tabulated above do not include $24,000 for preauthorization study of each of the areas, and the cost of navigation aids estimated at $44,000 for Moriches Inlet and $40,000 for Shinnecock Inlet.

4. *Annual costs and benefits.*—Average annual economic costs and benefits for the recommended improvements, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

Moriches Inlet

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$119,400	$96,400	$215,800
Maintenance, operation, and replacement	93,000	93,000	186,000
Maintenance of navigation aids	2,600		2,600
Total	215,000	189,400	404,400
Average annual benefits:			
Navigation			177,600
Improved tidal flow			289,000
Beach erosion control			242,500
Total			709,100
Ratio of benefits to costs			1.8

Shinnecock Inlet

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$125,900	$73,300	$199,200
Maintenance, operation, and replacement	118,000	71,000	189,000
Maintenance of navigation aids	2,100		2,100
Total	246,000	144,300	390,300
Average annual benefits:			
Navigation			221,200
Improved tidal flow			220,200
Beach erosion control			376,100
Total			817,500
Ratio of benefits to costs			2.1

5. Alternative analysis on the basis of an economic life of 100 years would be conjectural and has not been made. The measures proposed will provide for present and reasonably prospective needs and will not preclude later modification or expansion should the need arise.

6. *Allocation of costs.*—The results of allocation of the costs of the recommended improvements among project purposes by the separable costs, remaining benefits, priority of use, and incremental cost methods are summarized in the following tabulations. The cost of navigation aids has been excluded, the cost of pre-authorization studies has been included.

Allocation of costs by separable costs-remaining benefits method

Item and purpose	Moriches Inlet	Shinnecock Inlet	Total
First costs:			
Navigation	$2,408,000	$2,824,000	$5,232,000
Improved tidal flow	2,773,000	2,058,000	4,831,000
Beach erosion control	899,000	740,000	1,639,000
Total	6,080,000	5,622,000	11,702,000
Annual investment costs:			
Navigation	84,900	99,600	184,500
Improved tidal flow	97,800	72,600	170,400
Beach erosion control	31,700	26,100	57,800
Total	214,400	198,300	412,700
Maintenance, operation, and major replacement costs:			
Navigation	55,900	76,500	132,400
Improved tidal flow	98,200	82,300	180,500
Beach erosion control	31,800	29,700	61,500
Total	185,900	188,500	374,400
Total annual costs:			
Navigation	140,800	176,100	316,900
Improved tidal flow	196,000	154,900	350,900
Beach erosion control	63,500	55,800	119,300
Total	400,300	386,800	787,100

Allocation of costs by priority of use method

Item and purpose	Moriches Inlet	Shinnecock Inlet	Total
First costs:			
Navigation	$2,930,000	$3,425,000	$6,355,000
Improved tidal flow	1,826,000	1,145,000	2,971,000
Beach erosion control	1,324,000	1,052,000	2,376,000
Total	6,080,000	5,622,000	11,702,000
Annual investment costs:			
Navigation	103,300	120,800	224,100
Improved tidal flow	64,400	40,400	104,800
Beach erosion control	46,700	37,100	83,800
Total	214,400	198,300	412,700
Maintenance, operation, and major replacement costs:			
Navigation	74,300	100,400	174,700
Improved tidal flow	64,700	45,900	110,600
Beach erosion control	46,900	42,200	89,100
Total	185,900	188,500	374,400
Total annual costs:			
Navigation	177,600	221,200	398,800
Improved tidal flow	129,100	86,300	215,400
Beach erosion control	93,600	79,300	172,900
Total	400,300	386,800	787,100

Allocation of costs by incremental cost method [1]

Item and purpose	Moriches Inlet	Shinnecock Inlet	Total
First costs	$6,080,000	$5,622,000	$11,702,000
Annual investment costs	214,400	198,300	412,700
Maintenance, operation, and major replacement costs	185,900	188,500	374,400
Total annual costs	400,300	386,800	787,100

[1] Under this method all project costs are allocated to the navigation function.

The costs allocated in the above tables include $24,000 in each area for preauthorization studies. Costs of navigation aids are excluded.

7. *Local cooperation.*—The costs of the recommended project allocated to particular project purposes have, in turn, been apportioned between the Federal Government and local interests. Costs have been apportioned and other conditions of local cooperation have been established in accordance with normal procedures for similar projects, responsive to policies established in water resources legislation. The recommended terms of local cooperation, based on allocation of costs by the separable costs-remaining benefits method, are as follows:

(*a*) Moriches Inlet: Contribute in cash 45 percent of the cost of construction by the Corps of Engineers, presently estimated at $2,725,000, and agree to contribute in cash 50 percent of the maintenance, operation, and replacement, presently estimated at $93,000 annually, or perform work of equal value when and as acceptable to the Chief of Engineers.

(*b*) Shinnecock Inlet: Contribute in cash 37 percent of the cost of construction by the Corps of Engineers, presently estimated at $2,071,000, and agree to contribute in cash 38 percent of the maintenance, operation, and replacement, presently estimated at $71,000 annually, or perform work of equal value when and as acceptable to the Chief of Engineers.

Provided further that in connection with the improvement of each inlet local interests, prior to construction, agree to (*a*) make the cash contributions either in a lump sum prior to commencement of the work, or in installments prior to commencement of pertinent work items, in accordance with work scheduled as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined; (*b*) furnish, free of cost to the United States, all lands, easements, rights-of-way, and suitable spoil-disposal areas for the intial work and for subsequent maintenance, when and as required; and (*c*) hold and save the United States free from damages due to the construction and maintenance of the project; (*d*) provide and maintain suitable terminal facilities when and as required for the accommodation of vessels that would navigate the inlets and adjacent bays, open to all on equal terms; and (*e*) maintain, for the duration of the economic life of the project, continued public ownership of the publicly owned shores and their administration for public use, and continued availability for public use of the privately owned shores upon which a portion of the Federal share of the cost is based.

8. The recommended apportionment of construction costs and annual maintenance operation, and replacement costs is as follows:

Item	Federal	Non-Federal	Total
Moriches Inlet:			
First cost:			
Construction	$3,331,000	$2,725,000	$6,056,000
Percent	(55)	(45)	(100)
Annual cost for maintenance, operation, and replacement	93,000	93,000	186,000
Percent	(50)	(50)	(100)
Shinnecock Inlet:			
First cost:			
Construction	3,527,000	2,071,000	5,598,000
Percent	(63)	(37)	(100)
Annual cost for maintenance, operation, and replacement	118,000	71,000	189,000
Percent	(62)	(38)	(100)

9. The apportionment of construction costs and annual maintenance, operation, and replacement costs would be as follows on the basis of alternative allocation of costs by the priority of use and incremental cost methods.

Apportionment of costs based on allocation by priority of use method

Item	Federal	Non-Federal	Total
Moriches Inlet:			
First cost:			
Construction	$3,452,000	$2,604,000	$6,056,000
Percent	(57)	(43)	(100)
Annual cost for maintenance, operation, and replacement	99,000	87,000	186,000
Percent	(53)	(47)	(100)
Shinnecock Inlet:			
First cost:			
Construction	3,639,000	1,959,000	5,598,000
Percent	(65)	(35)	(100)
Annual cost for maintenance, operation, and replacement	123,000	66,000	189,000
Percent	(65)	(35)	(100)

Apportionment of costs based on allocation by incremental cost method

Item	Federal	Non-Federal	Total
Moriches Inlet:			
First cost:			
Construction	$5,572,000	$484,000	$6,056,000
Percent	(92)	(8)	(100)
Annual cost for maintenance, operation, and replacement	186,000		186,000
Percent	(100)		(100)
Shinnecock Inlet:			
First cost:			
Construction	4,870,000	728,000	5,598,000
Percent	(87)	(13)	(100)
Annual cost for maintenance, operation, and replacement	189,000		189,000
Percent	(100)		(100)

10. *Discussion.*—The recommended projects for Moriches and Shinnecock Inlets comprise logical and economically justified means of meeting the desires of local interests for improvement of these areas. There are no practicable alternatives for serving the combined purposes of navigation improvement, beach erosion control, and improvement of tidal flow.

Shem Creek, Charleston Harbor, S.C.

(H. Doc. No. 35, 86th Cong., 1st Sess.)

1. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Charleston Harbor, S.C., to provide for maintenance of a channel in Shem Creek, 10 feet deep, 90 feet wide, and about 1,150 feet long, upstream from the head of the existing project, and to provide for maintenance of a channel 10 feet deep and 90 feet wide in Hog Island Channel from Shem Creek to the Atlantic Intracoastal Waterway.

2. *Project costs and benefits.*—The recommended improvement will increase the annual Federal cost of maintenance of Charleston Harbor by about $3,800 based on prices prevailing in 1957 and need for maintenance and dredging at about 3-year intervals. Non-Federal costs of maintenance dredging in berthing areas and of providing spoil disposal areas are estimated at about $350 annually. Benefits resulting from reduction in damage to fishing vessels and increased fish catch will substantially exceed the estimated Federal and non-Federal costs.

3. *Discussion.*—Maintenance of the Shem Creek and Hog Island Channel as proposed, comprises a logical and economically justified means of serving the needs of existing and prospective commerce in Shem Creek. There are no practicable alternatives.

PASCAGOULA HARBOR, MISS.

(H. Doc. 98, 86th Cong.)

1. *Navigation problem.*—This report concerns determination of the advisability of modification of the existing Federal navigation project for Pascagoula Harbor, Miss., including maintenance of modifications already made by local interests.

2. The improvements for Pascagoula Harbor presently being maintained by the Federal Government consist of a channel 25 feet deep and 300 feet wide across the outer bar at Horn Island Pass, thence 22 feet deep and 225 feet wide across Mississippi Sound up Pascagoula River to the Louisville and Nashville Railroad bridge, thence 22 feet deep and 150 feet wide up Pascagoula and Dog Rivers to Highway 63 bridge over Dog River, thence 12 feet deep and 125 feet wide, via a cutoff channel through Robertson and Bounds Lakes to mile 4 on Dog River.

3. In 1949 local interests enlarged the channels of the Pascagoula Harbor project to provide a depth of 35 feet through Horn Island Pass, a depth of 30 feet through the Mississippi Sound and Pascagoula River to the Louisville and Nashville Railroad bridge, and a turning basin with a depth of 30 feet on the west side of the channel below the railroad bridge. However, this work has not been maintained. In addition, local interests have recently completed a deep-draft channel and turning basin serving an industrial area along Bayou Casotte, about 4 miles east of the mouth of Pascagoula River. The channel, about 3 miles long, extending from the Pascagoula ship channel to the mouth of Bayou Casotte, is 30 feet deep and 225 feet wide. The inner channel, 300 feet wide and 4,850 feet long, and turning basin, 1,000 feet wide and 1,750 feet long, were also dredged to a depth of 30 feet.

4. Local interests desire restoration and maintenance of the project channel through Horn Island Pass and Mississippi Sound, and in Pascagoula River to the railroad bridge, to the dimensions dredged by local interests in 1949; modification of the existing project to include maintenance of the Bayou Casotte channel and basin dredged by local interests in 1957 and 1958; and modification of the existing project to include maintenance of a navigable channel in Dog River from the present upper limits of the project, at mile 4 to mile 6 or some point in the vicinity of the International Paper Co. mill. They claim that the controlling channel depth (22 feet) as presently maintained under the existing Federal project imposes undue restrictions on shipping and deprives Pascagoula of considerable deep-draft traffic that might otherwise serve the port; channel depths at all other seaports in the gulf exceed the controlling depth at Pascagoula Harbor; local shipbuilding interests are unable to bid competitively on construction contracts for the larger seagoing vessels because of inadequacy of channel dimensions; local manufacturing and processing concerns engaged in export and coastwise trade are now using Mobile and New Orleans because the limited channel facilities at Pascagoula will not accommodate the type of shipping required; extension of the project on Dog River to mile 6 to provide maintenance of channel to millsite is warranted because of the annual movement of about 100,000 tons of pulpwood; the prospective commerce to the industrial plants located in the newly developed Bayou Casotte industrial area is ample to justify Federal maintenance of the 30-foot channel and basin dredged by local interests; and that they have contributed about $4,800,000 toward improvement of harbor facilities and in addition thereto industry is investing $30 million or more. They consider these investments indicative of economic growth in the area, which contributes toward the need for improved port facilities. Local interests have indicated willingness and ability to fully meet the items of cooperation required.

5. The River and Harbor Act approved September 3, 1954, authorized modification of the existing project for Pascagoula Harbor in accordance with plans on file in the Office, Chief of Engineers. The President, in approving that act stated that no appropriations would be requested prior to a favorable report on the project. The plans on file incorporate generally the improvements financed by local interests in 1949 at a cost of $739,513, consisting of enlargement of the project channels to provide a depth of 35 feet and width of 325 feet through Horn Island Pass, a depth of 30 feet and a width of 275 feet through the Mississippi Sound and Pascagoula River to the Louisville and Nashville Railroad bridge, and a turning basin 30 feet deep, on the west side of the channel below the bridge.

6. *Recommended improvement.*—Construction and maintenance of the Pascagoula Harbor improvement from the Gulf of Mexico to the Louisville and Nashville Railroad bridge, as authorized by the River and Harbor Act of 1954 is economically justified and is in accordance with the most suitable plan for the harbor facilities.

This work consists of a channel 35 feet deep and 325 feet wide through Horn Island Pass, thence 30 feet deep and 275 feet wide through Mississippi Sound and up the Pascagoula River to the railroad bridge, and a turning basin having a depth of 30 feet, a maximum width of 950 feet, and an approximate length of 2,000 feet on the west side of the channel below the railroad bridge; at a first cost to the United Statet of $1,189,000 for construction and $155,000 annually for maintenance in addition to that now required. The requirements of local cooperation for this work are as follows: (*a*) furnish without cost to the United States, all lands, easements, rights-of-way, and spoil-disposal areas for construction and subsequent maintenance of such works, when and as required; (*b*) provide suitable public terminal facilities, open to all on equal terms, and maintain adequate depths for navigation adjacent thereto; and (*c*) hold and save the United States free from damages due to construction and maintenance of the project.

7. The additional work recommended comprises (*a*) maintenance of the existing Bayou Casotte channel and basin to a depth of 30 feet and a width of 225 feet in the channel from the Pascagoula Harbor ship channel in Mississippi Sound to the mouth of Bayou Casotte, a distance of about 3 miles; a depth of 30 feet and a width of 300 feet in the inner channel for a distance of about 1 mile; and a depth of 30 feet for a width of 1,000 feet and a length of 1,750 in the turning basin, and (*b*) maintenance of the existing channel in Dog River, from the upper limit of the Federal project at mile 4 to the vicinity of mile 6, to a depth of 12 feet and a width of 125 feet. The requirements of local cooperation for this work are as follows: (*a*) furnish without cost to the United States, all lands, easements, rights-of-way and spoil-disposal areas for construction and subsequent maintenance of such works, when and as required; (*b*) provide suitable public terminal facilities, open to all on equal terms, and maintain adequate depths for navigation adjacent thereto; and (*c*) hold and save the United States free from damages due to construction and maintenance of the project.

8. *Project economics.*—First and annual costs, annual benefits, and benefit-cost ratios for the work authorized by the River and Harbor Act of 1954 and the additional work recommended are as follows:

Items	Pascagoula Harbor ship channel	Bayou Casotte channel and basin	Dog River
First costs:			
Federal:			
Construction	$1,189,000		
Preauthorization studies	[1] 6,000	[1] $3,000	
Aids to navigation		15,100	
Subtotal	1,195,000	18,100	
Non-Federal		[1] 2,000,000	
Total	1,195,000	2,018,100	
Annual carrying charges:			
Federal	197,100	155,000	$1,000
Additional maintenance dredging (included in above)	(155,000)	(153,000)	(1,000)
Non-Federal		70,500	
Total	197,100	225,500	1,000
Average annual benefits	355,200	1,003,800	3,200
Benefit-cost ratio	1.80	[2] 4.45	3.20

[1] Sum has already been expended.
[2] Based on assumption that Pascagoula Harbor ship channel below junction of Bayou Casotte channel will be maintained to 30-foot depth in Mississippi Sound and 35-foot depth through Horn Island Pass.

The foregoing figures are computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent. In the case of the Bayou Casotte channel and basin the benefit-cost ratio computed on the basis of the added cost of maintenance, which is the only future obligation necessary to obtain the benefits credited, would be about 6.48. There are no practicable alternatives to the measures proposed.

9. *Apportionment of costs.*—The apportionment of project costs is in accordance with normal procedure for navigation projects of this kind, responsive to river and harbor legislation.

EVERGLADES HARBOR, COLLIER COUNTY, FLA.

(H. Doc. 147, 86th Cong.)

1. *Navigation problem.*—Everglades, the county seat of Collier County, is on the west coast of southern Florida. Its harbor consists of the lower 1.7 miles of Barron River. The terminal wharves, fishhouses, and bulkheads are principally downstream from the marine ways about 1.5 miles above the river mouth. There is no authorized Federal project for improvement. However, under authority of section 3 of the River and Harbor Act of 1945, the United States in 1950 dredged the bay channel, which then had a controlling depth of about 4.7 feet, to provide a depth of 7 feet for a width of 90 feet, except where rock was encountered. This work cost $56,608. At various times, local interests have dredged the river, in part to obtain material for land fill. This work, along with removal of a rock shoal and accomplishment of a cutoff, has provided a harbor channel with a controlling depth of 6 feet and a turning basin near the marine ways. In 1924 they dredged a channel 5 to 9 feet deep from the river mouth across Chokoloskee Bay to the fringe of islands bordering the Gulf of Mexico, a distance of 1.6 miles. Thence a natural channel generally 11 to 15 feet deep and 5 miles long winds through the islands to the gulf at Indian Key Pass. The 10-foot depth in the gulf is 3 miles farther seaward. The mean tidal range is 3.4 feet at the pass and 2 feet in Barron River. Waterborne commerce consists of fresh fish, shrimp, and passengers transported on charter-fishing boats and in private recreational craft. It is estimated that about 500 vessels with drafts up to 7 feet use the harbor for about 11,000 round trips per year. Difficulties attending navigation arise largely from inadequate channel dimensions leading to groundings and vessel damage.

2. Local interests desire a channel 10 feet deep and 90 feet wide, with no sharp or difficult bends from the Gulf of Mexico to the marine ways on Barron River. They claim that the improvement would reduce damages and delays to the fleet of boats using the harbor, enhance the harvesting of seafoods, reduce seafood losses which result from vessel groundings, facilitate use of the marine ways, and serve as a water gateway for the Everglades National Park. They state that the prospective commerce includes export of cattle and lumber to Cuba. Local interests are willing and able to meet the requirements of cooperation.

3. *Recommended improvement.*—The recommended improvement of Everglades Harbor would provide a channel 60 feet wide and 8 feet deep from that depth in the Gulf of Mexico to mile 1.5 in Barron River, with a turning basin about 0.5 acre in area near the upper end; generally in accordance with the plan of the district engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost of $136,300 for construction and $8,900 annually for maintenance; provided that, prior to construction, local interests agree to: (*a*) contribute in cash 14 percent of the cost for construction, and that such contribution, presently estimated at $19,100, be paid in a lump sum prior to commencement of construction, the final allocation of costs to be made after actual costs have been determined; (*b*) provide without cost to the United States all necessary lands, easements, rights-of-way, and spoil-disposal areas, including dikes and spillways, for the construction and subsequent maintenance of the project, when and as required; (*c*) hold and save the United States free from damages due to the construction and maintenance of the improvements; and (*d*) provide and maintain without cost to the United States necessary mooring facilities and utilities, including a public landing with suitable supply facilities, open to all on equal terms. The net cost to the United States for the recommended plan of improvement is estimated at $117,200 for construction and $8,900 annually for maintenance.

4. *First cost.*—The construction costs for recommended improvement given above are based on prices and conditions prevailing in 1958. Total first costs including the costs of construction; preauthorization studies; navigation aids; lands and easements; and spoil-area dikes and spillways are as follows:

Federal	$158,600
Non-Federal	24,600
Total	183,200

5. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, based on an economic life of 50 years and an interest rate of 2.5 percent are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$5,600	$900	$6,500
Maintenance	[1] 11,000		11,000
Total	16,600	900	17,500
Average annual benefits:			
Reduction in damages to fishing boats and commercial craft			9,100
Increased net value of shrimp catch			6,600
Increased recreational values			1,400
Reduction in damage to recreational boats			4,600
Total			21,700
Ratio of benefits to costs			1.2

[1] Includes $2,100 for maintenance of navigation aids.

Alternative analysis on the basis of an economic life of 100 years would be conjectural and would not provide a basis for selection of alternative measures to meet the needs of present and prospective commerce.

6. *Apportionment of costs.*—The costs of the recommended improvement have been apportioned between the Federal Government and local interests in accordance with normal procedures for projects of this kind. The recommended local cooperation requirements are stated above. The contribution toward the cost of project construction is based on the finding that 14 percent of the total project benefits will be local in nature. In reaching this conclusion, benefits related to recreation were considered to be half general and half local in nature. All other project benefits were considered to be general in nature. Local interests are willing and able to meet the requirements of local cooperation.

7. *Discussion.*—In selecting the recommended plan of improvement consideration was given to alternative alinements and channel dimensions. A channel depth of 10 feet, as requested by local interests, would require extensive dredging in the open gulf with attendant material increases in first and maintenance costs. There would be no commensurate increase in project benefits. The selected channel width of 60 feet in lieu of the 90-foot width desired by local interests will accommodate present and prospective traffic without serious difficulty, with substantial savings in cost. The selected channel alinement will take advantage of previous dredging.

Gulf Coast Harbors, Fla.

(H. Doc. 183, 86th Cong.)

1. *Introduction.*—This report considers the advisability of improvements for navigation at Venice, Lemon Bay, Fort Myers Beach, and Naples, Fla. These communities are on the gulf coast 40, 52, 110, and 135 miles, respectively, south of Tampa Bay. This section of Florida has intermittent waterways parallel to the coast, separated from the gulf by a chain of narrow islands or keys. Numerous inlets or passes connect the gulf with interior waters. The authorized Federal Intracoastal Waterway will, when constructed, provided a through channel 9 feet deep and 100 feet wide from Caloosahatchee River near Fort Myers Beach northward 148 miles to Anclote River. The tributary area includes coastal areas of Sarasota, Charlotte, Lee, and Collier Counties. Principal business activities are the growing of winter vegetables and citrus fruits, shrimping, commercial fishing, and catering to tourists and winter visitors.

2. *Navigation problems, and improvements considered and recommended.*—(*a*) Venice: Venice is on the southern gulf coast of Florida in Sarasota County, adjacent to the existing Federal project for Caseys Pass. Local interests request a channel 9 feet deep and 75 feet wide from Caseys Pass to and including a turning basin near U.S. Highway 41, a total distance of 0.5 mile. They claim these improvements would increase the gross revenue of fishermen, double charter-boat revenues, and benefit recreational craft and barge service. Construction of the authorized intracoastal waterway would provide the channel desired. Thereafter, provision of a basin would fulfill the requests of local interests. The considered plan of improvement would provide a basin 9 feet deep, 200 by 300 feet, adjacent to the authorized intracoastal waterway at Venice.

(*b*) Lemon Bay: Lemon Bay is a shallow, coastal lagoon on the gulf coast of peninsular Florida, about 15 miles south of Venice. Access to the gulf from Lemon Bay is via Stamp Pass, a shifting natural inlet generally 4 feet deep,

about 4 miles south of Englewood. Local interests request a jetty-protected inlet through Blind Pass and a channel 9 feet deep and 300 feet wide from the gulf to Englewood. They claim these improvements would result in increased fish catch, addition of shrimp and charter boats to the local fleet, increased clam production, and increased community income from the fishing industry and retail business. They also claim savings due to reduction in boat damage, loss, and operating expense. The project considered would provide a jetty-protected inlet channel 12 feet deep from the gulf to Lemon Bay, and a connecting channel 9 feet deep to Englewood across the bay, total length 1.5 miles.

(*c*) Fort Myers Beach: Fort Myers Beach is on Estero Island near the mouth of Caloosahatchee River, about 20 miles below Fort Myers. The gulf entrance to Fort Myers Beach shrimp-boat terminals is through San Carlos Bay and Matanzas Pass. There is no authorized Federal navigation project at Fort Myers Beach. Local interests request a channel 15 feet deep and 300 feet wide from Matanzas Pass to the Gulf of Mexico, protected on the south by a jetty and terminating with a turning basin landward of the bridge that spans the pass. They claim that these improvements would benefit the shrimping and fishing fleet by minimizing groundings, lost fishing time, and delay awaiting tides. Additional benefits are claimed for use of the channel by prospective deeper draft boats. The recommended project would provide a navigation channel 12 feet deep and 150 feet wide from the Gulf of Mexico through San Carlos Bay and thence 11 feet deep and 125 feet wide through Matanzas Pass to the upper shrimp-boat terminals, a total distance of 2.1 miles.

(*d*) Naples: Naples is on the southern gulf coast of Florida in Collier County, about 25 miles south of Fort Myers Beach. The existing project for a channel from Naples to Big Marco Pass, Fla., substantially completed in 1940, provides for an interior channel 6 feet deep and 70 feet wide from Naples to the landward side of Big Marco Pass, 13.9 miles. Because of recurring shoaling in Gordon Pass, boats are frequently required to use the circuitous and longer route via the Naples-Big Marco Pass project and unimproved Big Marco Pass in traveling between Naples and the Gulf of Mexico. Local interests request a jetty-protected entrance channel, 14 feet deep and 200 feet wide, from the Gulf of Mexico through Gordon Pass, and a connecting channel, 12 feet deep and 100 feet wide, to upper Naples Bay, terminating with a turning basin. They claim benefits from increased fish and shrimp catch. The recommended improvement would provide a channel 12 feet deep and 150 feet wide in the Gulf of Mexico, thence 10 feet deep and 100 feet wide through Gordon Pass to upper Naples Bay, thence 10 feet deep and 70 feet wide for 400 feet to U.S. Highway 41 Bridge; and two turning basins.

3. *Project costs and benefits.*—

Item	Venice	Lemon Bay	Fort Myers Beach	Naples
First cost: [1]				
Federal			[2] $204,100	[3] $264,800
Local			[4] 4,900	[5] 140,200
Total	$17,500	$987,000	209,000	405,000
Average annual cost: [6]				
Interest and amortization	600	34,800	7,400	14,300
Maintenance	900	13,100	[7] 21,600	[8] 40,000
Total	1,500	47,900	29,000	54,300
Average annual benefits:				
Reduce vessel delay and damage		4,700	55,700	28,400
Increased seafood landing		5,300		
Recreational boating		8,600		37,700
Land enhancement			1,500	10,000
Total	800	18,600	57,200	76,100
Ratio of benefits to costs	0.5	0.4	2.0	1.4

[1] Based on prices and conditions existing in 1958.
[2] Includes $22,300 already incurred for preauthorization studies and $16,000 for navigation aids.
[3] Includes $41,600 already incurred for preauthorization studies and $16,000 for navigation aids.
[4] Includes cash contribution of $2,200 and $2,700 for clearing of spoil areas.
[5] Includes cash contribution of $123,800.
[6] Based on economic life of 50 years, interest rate of 2.5 percent, and experienced maintenance costs for similar work.
[7] Includes $1,600 for maintenance of navigation aids.
[8] Includes $1,000 for maintenance of navigation aids.

Analysis on the basis of an economic life of 100 years would be conjectural and would not change the relative economic merit of recommended and possible alternative improvements.

4. *Physical feasibility and cost of providing for future needs.*—The measures considered at all four localities would be physically feasible and would meet the requirements of existing and prospective navigation.

5. *Intangible project effects.*—Little or no intangible benefits are expected from the improvement recommended at Fort Myers Beach. The improvement recommended at Naples may contribute to saving of life and prevention of personal injury through improving the effectiveness of the harbor as a harbor of refuge.

6. *Allocation of costs.*—All of the improvements considered are for navigation and all project costs are allocable to this purpose.

7. *Apportionment of costs.*—The costs of the improvements recommended at Fort Myers Beach and Naples were apportioned between the Federal Government and local interests in accordance with normal procedure for similar navigation projects. The cash contributions required are in proportion to the incidence of project benefits, general and local. Local interests have indicated willingness and ability to meet the requirements of local cooperation for the recommended work.

8. *Alternative considerations.*—The measures considered at Venice are the practicable minimum size which would serve present and prospective traffic. Larger facilities would be more costly but would not return additional benefits. The alternative inlet improvement without jetties considered at Lemon Bay would either damage adjacent beach property through erosion, or would entail large expenditures for corrective measures. Lesser improvements than those recommended at Fort Myers Beach would not adequately meet the needs of existing vessel traffic. Greater improvements would be more costly without compensating increase in benefits. Various jetty systems and both deeper and shallower channels were considered at Naples, but the recommended work was found to be best adapted to the needs of the area.

Bakers Haulover Inlet, Fla.

(H. Doc. 189, 86th Cong.)

1. *Navigation problem.*—Bakers Haulover Inlet, a land cut across a barrier beach, provides an access from the Atlantic Ocean to northern Biscayne Bay, Fla. The inlet is 1,100 feet long, 300 feet wide at the ocean end, and 500 feet wide in the landward portion. It is used in conjunction with channels in the bay connecting to the Intracoastal Waterway, and a marina. Sport fishing and recreational boating are the principal activities served and to be served by the improvements. Existing jetties needed for navigation through the inlet have partially collapsed, and seaward bulkheads are in bad repair. Unless these works are rehabilitated, the inlet works will eventually fail, causing the inlet to widen, shoal, and eventually close. An extensive shoal formed by beach sand carried through the inlet by tidal currents hampers present navigation.

2. *Recommended improvement.*—The recommended improvement provides for reconstruction of the existing jetties; protection of the inlet shores seaward of the existing 500-foot section; dredging, when necessary, a channel 11 feet deep and 200 feet wide through the 300-foot section of the inlet, thence 8 feet deep and 100 feet wide west and north to and including a marina basin 200 feet wide, and thence 8 feet deep and 100 feet wide both west and north to the Intracoastal Waterway.

3. *First cost.*—The estimated first cost of the recommended improvement, based on prices and conditions existing in 1958, is as follows:

Federal	[1] $271,000
Non-Federal	[2] 241,000
Total	[1] 512,000

[1] Includes $13,000 for navigational aids and $19,000 for preauthorization studies.
[2] Includes cash contribution of $239,000.

4. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Interest and amortization	$9,600	$8,500	$18,100
Maintenance [1]	11,100	0	11,100
Total	20,700	8,590	29,200
Average annual benefits:			
Benefits from marking and maintaining a usable navigation channel through the entrance, based on continuation of benefits that would otherwise be lost			91,000
Benefits from marking and maintaining the channels in Biscayne Bay			3,000
Total			94,000
Ratio of benefits to costs			3.2

The separable units of the recommended improvement are economically justified individually. Analysis of project economics on the basis of a project life of 100 years would be conjectural.

5. *Apportionment of costs.*—Prospective benefits from the recommended navigation improvements are entirely recreational, and the recommended local cooperation consists of a cash contribution of one-half the construction cost, as well as lands, easements, and rights-of-way and other requirements in accordance with normal procedure for similar projects.

6. *Discussion.*—The existing inlet works at Bakers Haulover Inlet are deteriorated, and without repair and rehabilitation these works, consisting of jetties and bulkheads, would eventually fail, and navigation through the inlet would not be possible. The improvements recommended are planned to maintain existing access from the ocean to Biscayne Bay. There are no alternative accesses in the vicinity of Bakers Haulover Inlet which could serve this purpose. Consideration was given to providing for 12-foot navigation through the inlet and in the bay channels instead of 8-foot navigation, but this depth would not be justified at this time. Consideration was also given to widening the inlet and enlarging the jetties, but these improvements also would not be economically justified.

Consideration also was given to construction of walkways on the recommended jetties as a recreational measure, subject to local interests bearing the entire net increase in project cost due to this feature. Local interests, represented by the director of public works, Metropolitan Dade County, state that they do not desire such walkways at local expense as part of the recommended jetties.

Miami Harbor, Fla.

(S. Doc. 71, 85th Cong.)

1. *Navigation problem.*—Miami Harbor is in Biscayne Bay. The bay is separated from the ocean by a narrow peninsula and a chain of small islands. An existing Federal project provides for (*a*) a channel 30 feet deep and 500 feet wide from the ocean to near the outer end of the north jetty, thence 30 feet deep and 300 feet wide through the entrance cut and across Biscayne Bay to and including a turning basin in front of the municipal terminals at Miami, 1,400 by 1,350 feet and 30 feet deep; two parallel rubblestone jetties at the entrance, 1,000 feet apart and 3,000 and 2,750 feet long, and rubblestone revetment on both sides of the 1,000-foot-wide entrance cut; completed March 1939; (*b*) a channel 15 feet deep and 200 feet wide from the mouth of Miami River to the turning basin at the municipal terminals; a channel 8 feet deep and 200 feet wide from the mouth of Miami River to the Intracoastal Waterway and thence 100 feet wide easterly to the entrance cut; not constructed; (*c*) the Virginia Key project providing for an airport-seaport island; an approach channel, turning basin, and additional dredging for fill; not constructed and now inactive; and (*d*) a channel, 6 to 8 feet deep and generally 700 feet wide, at Dinner Key; completed in 1933 and now inactive. In addition the Intracoastal Waterway, Miami to Key West, Fla., crosses the turning basin and is completed to project dimensions, 7 feet deep and 90 feet wide, in this reach. Local interests have dredged channels and an anchorage, and have provided both municipal and private terminal facilities.

2. The present municipal terminals on the Miami waterfront are outmoded and inefficient for present-day ships and freight and passenger handling and are severely deteriorated. The city of Miami and others want the port terminal moved from its present location. Dry cargo facilities would be located on the low and undeveloped Dodge Island, the westernmost of the island chain formed by spoil dredged from the existing ship channel. The tanker terminal would go to Fisher Island, formed by the entrance cut through the peninsula. In addition, widening of the ship channel and enlargement of the turning basin are desired. The city proposes to finance its share of the new development by the proceeds from a bond issue and by filling the present port area and then selling it for high-type hotel and commercial use. City representatives have stated that in their opinion local interests would be able and willing to meet the requirements proposed by the reporting officers. Opposition to the Dodge Island development is mostly because of its anticipated adverse effect on esthetic values and the consequent probable deterioration of real estate values in its vicinity.

3. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Miami Harbor, Fla., by deleting the Virginia Key development and the Dinner Key approach channel and by widening the existing ship channel by easing the ocean bend and increasing the width of the 300-foot-wide section to 400 feet, enlarging the existing turning basin 300 feet along both the south and northeasterly sides, and dredging a turning basin along the north side of Fisher Island about 39 acres in extent and 30 feet in depth, provided that local interests furnish, free of cost to the United States, all lands, easements, rights-of-way, and suitable spoil-disposal areas (adequately diked or bulkheaded where required) for the initial work and for subsequent maintenance, when and as required, and agree to (*a*) contribute in cash 21.6 percent of the total cost of Federal dredging, subject to modification depending upon the dredging plan of spoil disposition; and that such payments totaling an estimated $1,051,000 be paid either in a lump sum prior to commencement of construction or in installments prior to commencement of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, the final allocation of cost to be made after actual costs have been determined, or contribute items of work of equal value when and as acceptable to the Chief of Engineers; (*b*) hold and save the United States free from damages due to the construction and maintenance of the project; (*c*) provide in advance of or concurrently with Federal dredging, and operate and maintain, adequate public terminal and transfer facilities including an oil terminal, open to all on equal terms; (*d*) dredge and maintain berthing areas and non-Federal approaches thereto; and (*e*) alter or relocate all cables, mains, or other installations as required for project construction.

4. *First cost.*—The estimated first cost of the recommended improvement, based on prices and conditions existing in 1957, is as follows:

Federal	[1] $3,893,000
Non-Federal	2,116,000
Total	6,009,000

[1] Including $18,000 for navigation aids.

5. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

Average annual costs:	
Capital costs	$211,900
Maintenance dredging	36,500
Maintenance of navigation aids	3,200
Total	251,600
Average annual benefits:	
Prevention of vessel damage and delay	357,000
Land enhancement	153,000
Total	510,000
Ratio of benefits to costs	2.03

Each separable element of the project is economically justified individually. Analysis on the basis of an economic life of 100 years would not change the relative economic merit of the recommended improvement and the alternative improvements considered.

6. *Apportionment of costs.*—The costs of the recommended improvement are apportioned between the Federal Government and local interests in accordance with normal procedure for similar navigation improvements. The requirements of local cooperation are described in the paragraphs above. The cash contribution required is in recognition of land-enhancement benefits and the additional cost of placing spoil in accordance with the desires of local interests.

7. *Discussion.*—From the standpoint of navigation and commerce, the recommended or Dodge Island plan has several advantages. It would provide facilities close to the entrance channel to the harbor and close to the Miami waterfront, readily accessible to shipping and convenient for freight distribution. It would remove unsightly and potentially dangerous petroleum storage from highly developed port facilities and metropolitan areas. In common with other possible plans it would provide modern and efficient freight-handling facilities capable of serving present and prospective traffic for some time to come. With the provision of the recommended improvement the presently authorized Virginia Key development, on which no work has been done, could serve no useful purpose, and the Dinner Key channel, completed by the United States to provide access to a seaplane base, is no longer needed for that purpose.

8. Opponents of the recommended plan have recognized the need for a new port development but question the adequacy and suitability of the measures proposed. Alternative development of Virginia Key was considered. The cost of facilities at or near Virginia Key, including a ship channel and turning basin, would exceed the cost of comparable Dodge Island development by a substantial amount. Large additional freight transfer costs would be involved. It is probable, also, that development in the Virginia Key area would have adverse affect on the fish and wildlife resources of that section of Biscayne Bay. On the basis of these considerations the recommended plan is considered to be preferable to alternative development in the vicinity of Virginia Key.

Bayou Lafourche and Lafourche-Jump Waterway, La.

(H. Doc. 112, 86th Cong.)

1. *Navigation problem.*—Bayou Lafourche serves as the water link between the producing oil fields along its course and refineries and supply centers, as well as serving the fishing industry. Recent development of oilfields along and near lower reaches of the bayou, and growth in the fishing industry following discovery of offshore shrimping resources in 1938 and development of the quick-freezing process, have resulted in serious congestion and difficulties in navigating the waterway. The existing channel in Bayou Lafourche is inadequate for present and reasonably prospective future navigation, and need exists for a waterway paralleling the gulf coast from Bayou Lafourche to the Mississippi River at the Jump. Other connecting routes, including a channel from the east side of Barataria Bay to Grand Ecaille, would be desirable.

2. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Bayou Lafourche, La., to provide for dredging an auxiliary channel 12 feet deep and 125 feet wide, from the Intracoastal Waterway at mile 37.2 west of Harvey lock, generally parallel to and west of Bayou Lafourche along Grand Bayou Blue, to Bayou Lafourche below the highway bridge at Leeville at mile 12, thence in the bayou to the 12-foot depth in the Gulf of Mexico; dredging a channel 9 feet deep and 100 feet wide in Bayou Lafourche from Leeville to the vicinity of the lower limits of Golden Meadow; restoring and extending the existing jetties at Belle Pass from the 6-foot to the 12-foot depth, if found advisable in order to reduce maintenance dredging in the Gulf of Mexico; and dredging a channel 12 feet deep and 125 feet wide from Bayou Lafourche at Leeville through the Southwest Louisiana Canal to and through Bayou Rigaud.

3. *First cost.*—The estimated first cost of the recommended improvement, based on prices and conditions existing in 1956, is as follows:

Federal	[1] $4,682,000
Non-Federal	1,343,000
Total	6,025,000

[1] Including $18,000 for navigation aids.

4. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$165,000	$47,300	$212,300
Maintenance	69,700	30,000	99,700
Total	234,700	77,300	312,000
Average annual benefits: Savings in the transportation of petroleum, equipment, and supplies for oil exploration activities, and sulfur; harbor of refuge benefits; and reduced operating costs for the fishing fleet			444,800
Ratio of benefits to costs			1.4

The separable units of the recommended improvement are economically justified individually. Analysis of project economics on the basis of an economic life of 100 years would be conjectural.

5. *Apportionment of costs.*—The apportionment of project costs between Federal and non-Federal interests is in accordance with normal procedure for commercial navigation improvements. The estimated non-Federal first cost of $1,343,000 would provide for dredging a stub channel from Golden Meadow to the new auxiliary channel, constructing a pontoon bridge across the new auxiliary channel near Larose, furnishing rights-of-way, lowering pipelines and submarine cables, and providing spoil disposal areas. Non-Federal interests would be required to maintain the stub channel and pontoon bridge.

6. *Discussion.*—Enlargement of the Bayou Lafourche channel in lieu of the recommended auxiliary channel is impracticable because of developments along both banks of the Bayou. Although a Lafourche-Jump Waterway would afford a much needed east-west route between Bayou Lafourche and the Mississippi River, would traverse a marshy area rich in petroleum, sulfur, and seafoods, and would be economically justified, local interests have indicated that they would not furnish necessary rights-of-way. However, the recommended improvement between Bayou Lafourche and Barataria Pass will partially fulfill the need for an east-west channel and will not preclude the possibility of later extension to the Mississippi River. The improvements recommended are economically justified and will result in substantial reduction in the adverse conditions now affecting navigation.

Bayous Petit Anse, Tigre, and Carlin, La.

(S. Doc. No. 70, 85th Cong.)

1. *Navigation problem.*—Bayou Tigre leading southwest from Erath in Vermilion Parish, La.; Bayou Carlin, serving Delcambre on the Vermilion-Iberia Parish line; and Bayou Petit Anse draining the area southwest of New Iberia in Iberia Parish, join to flow into the Gulf Intracoastal Waterway about 3 miles east of the Vermilion-Iberia Parish line. Avery (or McIlhenny) Canal, an artificial navigation canal, extends south from the Intracoastal Waterway and Bayou Petit Anse to Weeks Bay, an arm of Vermilion Bay. The existing Federal project provides for channels with depths below mean low gulf level and bottom widths as follows: Bayou Petit Anse, 9 by 80 feet from the Intracoastal Waterway to the north end of Avery Island, about 6.1 miles; Bayou Carlin, 9 by 80 feet, from Lake Peigneur to its mouth, about 7.6 miles; and Avery Canal, 5 by 40 feet, from the Intracoastal Waterway into Vermilion Bay, 2.4 miles. Local interests desire enlargement of Bayou Petit Anse and Carlin to 12 by 125 feet, and increased horizontal clearance of 2 bridges at Delcambre to accommodate 50- and 52-foot wide barges of 9-foot draft; enlargement of Bayou Tigre to 9 by 80 feet to serve the sugar mill at Erath; relocation of Avery Canal on a shorter route and enlargement to 9 by 60 feet, to decrease maintenance costs of the channel, and reduce damage and loss of time to vessels; and construction of a small-boat anchorage and refuge harbor at Delcambre to accommodate 400 vessels up to trawler size. During rough and inclement weather over 300 shrimp boats at a time seek refuge near Delcambre, causing congestion in Bayou Carlin. No flood control or other related problems are known to exist in this area.

2. *Solutions considered.*—Consideration was given to an enlarged harbor of refuge at Delcambre, and enlargement of the Avery Canal in its present location.

Other routes for the Avery Canal were found more expensive than improvement of the existing route. The controlling depth of 7 feet in Vermilion Bay precludes economical plans of more than 7-foot depth in Avery Canal. A 9-foot project depth was found adequate for the harbor of refuge, and a canal section 7 by 60 feet. Consideration was also given to enlargement of the Bayou channels as requested by local interests but none of these plans would produce benefits commensurate with their costs.

3. *Plan of improvement.*—Modify existing project to provide for a channel in the Avery Canal 7 feet deep at mean low gulf level over a bottom width of 60 feet, and a mooring area suitable for about 150 boats along the right bank of Bayou Carlin below the south edge of Delcambre 9 feet deep at mean low gulf level, varying in width from about 200 feet at upstream end to 125 feet at the downstream end with local interests to provide normal requirements of cooperation in such navigation projects (see par. 4, below.) First and annual costs for the considered plans and estimated annual benefits are summarized below on the basis of fall 1956 prices and conditions, project life of 50 years, and an interest rate of 2½ percent.

Item	Federal	Non-Federal	Total
Harbor of refuge, Delcambre (recommended):			
First costs	$65,000	$42,000	$107,000
Annual costs:			
Interest and amortization	2,300	1,430	3,730
Maintenance		5,700	5,700
Total, annual	2,300	7,130	9,430
Annual benefits			20,000
Benefit-cost ratio			2.1
Avery Canal (recommended):			
First costs	41,000		41,000
Annual costs:			
Interest and amortization	1,440		1,440
Maintenance (increase)	10,000		10,000
Total, annual	11,440		11,440
Annual benefits			26,300
Benefit-cost ratio			2.3
Bayou Carlin:			
First costs	[1] 714,000	[1] 520,000	1,234,000
Annual costs:			
Interest and amortization	24,000	18,300	42,300
Maintenance	3,000	2,000	5,000
Total, annual	27,000	20,300	47,300
Annual benefits			11,600
Benefit-cost ratio			0.25
Bayou Petit Anse:			
First costs	329,000		329,000
Annual costs:			
Interest and amortization	11,600		11,600
Maintenance	1,000		1,000
Total, annual	12,600		12,600
Annual benefits			2,300
Benefit-cost ratio			0.18
Bayou Tigre:			
First costs	297,000	[1] 2,610,000	2,907,000
Annual costs:			
Interest and amortization	10,400	92,000	102,400
Maintenance	4,000	12,000	16,000
Total, annual	14,400	104,000	118,400
Annual benefits			[2]
Benefit-cost			[2]

[1] Including bridge reconstruction.
[2] Benefits negligible.

Analysis on the basis of an economic life of 100 years and an interest rate of 2.5 percent, assuming no appreciable increase in the cost of maintenance over the longer period, would give benefit-cost ratios slightly higher than those shown

above, but the unfavorable ratios for the plans for Bayous Carlin, Petit Anse, and Tigre would still be considerably below unity.

4. *Apportionment of costs and local cooperation.*—The first and annual costs are apportioned between Federal and non-Federal interests in accordance with long established policies for navigation projects. Local interests would be required to (*a*) furnish without cost to the United States all lands, easements, rights-of-way, and spoil-disposal areas necessary for construction of the project and for subsequent maintenance, when and as required; (*b*) hold and save the United States free from damages due to construction and maintenance of the project; (*c*) provide without cost to the United States necessary mooring facilities and an access roadway, in accordance with plans approved by the Chief of Engineers; (*d*) make all necessary alterations to buildings and utilities; (*e*) establish a competent and properly constituted public body empowered to regulate the use and development of the mooring area with the understanding that it will be open to all on equal terms; and (*f*) maintain and operate the mooring area and its facilities, including maintenance dredging between the realined channel and the mooring facilities.

5. *Discussion.*—The recommended improvements are economically justified and will be effective in meeting the needs of established and prospective commerce. Alternative improvements would be more costly, and additional improvements would lack economic justification by a wide margin under any reasonable basis of analysis. The measures recommended would not preclude later expansion of navigation facilities should need arise.

Gulf Intracoastal Waterway Channel to Port Mansfield, Tex.

(S. Doc. 11, 86th Cong.)

1. *Navigation problem.*—Local interests desire Federal assumption of maintenance and repair of the locally constructed jetties at the gulf entrance, and of the locally improved channels and basins; enlargement of channel and basin dimensions serving local traffic and traffic using the Intracoastal Waterway; depths of 18, 30, or 36 feet from the Gulf of Mexico to Port Mansfield; reimbursement of local interests as alternative to above, and establishment of maintenance dredging limits 30 feet from structures. Deterioration of the local jetties has resulted in silting of the entrance channel. Grounding of vessels in the entrance occurred several times during rough weather in late 1957 and early 1958. Local interests claim that an improved entrance from the gulf would encourage local industry, including offshore oil well drilling; provide interchange of waters between the Gulf and Laguna Madre to improve seafood production in the latter; allow deep-draft traffic to reach Port Mansfield; and provide refuge in storms to vessels in the southern gulf area. Opponents question the tangible nature of possible benefits, and claim that the desired improvements would duplicate other facilities and ports.

2. *Solutions considered.*—Four plans, A, B, C, and D were considered, and plan C (par. 3) recommended. Plans A and B would provide deep-draft channels 36 by 200 feet and 18 by 100 feet, respectively, each with turning basins of equivalent depth. Prospective deep-draft traffic is indefinite, and tentative estimates of benefits indicate lack of economic justification. Plan D, as an alternative to plan C, would rehabilitate the local improvements and, provide new jetties and a 10 by 100-foot channel.

3. *Recommended plan of improvement.*—Plan C would modify the existing Federal project for the Gulf Intracoastal Waterway, channel to Port Mansfield, Tex., to provide for an entrance channel from the Gulf of Mexico, 16 feet deep and 250 feet wide to Padre Island; thence a channel 14 feet deep and 100 feet wide to the Gulf Intracostal Waterway, with two turnout curves, 12 feet deep and 100 feet wide; thence 14 feet deep and 125 feet wide, to a turning basin at Port Mansfield, with the entrance curve into the turning basin widened to 200 feet and with two turnout curves, 12 feet deep and 200 feet wide, on the west side of the Gulf Intracoastal Waterway; a turning basin 14 feet deep and 400 feet wide for a length of 1,200 feet with an irregular extension having a maximum width of 1,000 feet; a shrimp-boat basin, 12 feet deep, 350 feet wide, and 1,450 feet long; a small-craft basin, 8 feet deep, 160 feet wide, and 800 feet long; and parallel jetties at the gulf entrance. Estimated first costs, annual costs, and

annual benefits on the basis of May 1958 prices, a 50-year project life, and a 2½-percent interest rate, for the four considered plans are:

[In thousands]

Item	Plan			
	A	B	C	D
First costs:				
Corps of Engineers	[1] $21,788	[1] $4,622	[1] $3,446	[1] $3,099
Coast Guard	29	20	20	20
Total [2]	21,817	4,642	3,466	3,119
Annual costs:				
Interest and amortization	799	164	123	110
Maintenance:				
Corps of Engineers	353	170	[3] 165	130
Coast Guard	6	5	5	5
Subtotal	359	175	170	135
Total, annual	1,158	339	293	245
Annual benefits [4]	316	316	316	276
Benefit-cost ratios	0.3	0.9	1.1	1.1

[1] Includes $15,000 preauthorization survey costs.
[2] All first costs Federal.
[3] Estimated cost of maintenance for plan C increased in Board's and Chief's report from $145,000 to $165,000 decreasing benefit cost from 1.2 to 1.1.
[4] Deep-draft benefits indefinite.

5. *Cost apportionment and local cooperation.*—All of the construction and project maintenance costs of the considered improvements are allocated to the Federal Government, in accordance with established policy on commercial navigation projects. Spoil disposal would be in Laguna Madre south of the improved channel. Local interests would be required to agree to: (*a*) Furnish free of cost to the United States all lands, easements, rights-of-way, and spoil-disposal areas necessary for construction and subsequent maintenance of the project, when and as required; (*b*) hold and save the United States free from damages due to construction and maintenance of the project; and (*c*) furnish assurances satisfactory to the district engineer that adequate terminal facilities for handling and icing seafoods will be provided, open to all on equal terms; and provided further that no dredging shall be done by the United States within 50 feet of any established pierhead line, wharf, or structure, except in the small-craft basin, where dredging shall not be done within 30 feet of any structure.

6. *Discussion.*—Analysis on the basis of a 100-year life and 2½-percent interest rate would change the amortization factor from 1.03 percent to 0.23 percent. This reduction of 0.8 percent in the estimated annual costs would increase the benefit-cost ratio of the recommended, and considered plans, assuming no increase in the costs of maintenance over the longer period. In the case of the deep draft plan B, tentative benefit-cost ratio of 0.9 would become 1.05. While the benefit-cost ratio for plan B thus would exceed unity, the additional costs for this plan, compared to plan C, would not produce any additional firm benefits based on presently available information of prospective intermediate draft (18-foot) traffic. Accordingly, there would be no basis for adoption of plan B in lieu of plan C.

Mississippi River Between Missouri River and Minneapolis, Minn., at Dubuque, Iowa

(H. Doc. 56, 86th Cong.)

1. *Navigation problem.*—The existing Federal navigation project for this reach of the Mississippi River provides for a 9-foot channel and a number of harbors at various localities. However, there is no Federal harbor project at Dubuque. Local interests have developed a commercial harbor in an embayment known

locally as Ice Harbor, access to and use of which is adversely affected by sedimentation. They desire dredging to accommodate craft using the 9-foot river channel, and Federal assumption of maintenance.

2. *Solutions considered.*—The only plan of improvement considered is the recommended plan.

3. *Recommended plan of improvement.*—The report recommends modification of the existing project for the Mississippi River between the Missouri River and Minneapolis, to provide for a commercial harbor at Dubuque, Iowa. The plan would provide a depth of 9 feet by dredging the Ice Harbor area, exclusive of a strip 40 feet wide around the perimeter which would be dredged as necessary by local interests to provide berthing areas for vessels. Estimated first and annual costs, and annual benefits, based on January 1958 prices, a 50-year project life and an interest rate of 2½ percent, are as follows:

	Amount
First costs:	
Dredging (Federal)	[1] $38,000
Non-Federal	5,000
Total	[1] 43,000
Annual costs:	
Federal:	
Interest and amortization (including survey)	1,410
Maintenance	6,000
Subtotal	7,410
Non-Federal	890
Total annual costs	8,300
Annual benefits	73,250
Benefit-cost ratio	8.8

[1] Excluding $2,000 for preauthorization survey.

Analysis on the basis of a 100-year project life and 2½ percent interest rate would increase the benefit-cost ratio slightly.

4. *Apportionment of costs.*—The proposed apportionment of the costs of dredging and maintaining berthing areas along the margins of the project is in accord with long-established Federal policy. The report proposed Federal dredging and maintenance of the general commercial harbor area.

5. *Discussion.*—The recommended plan is amply justified by anticipated benefits. Cost sharing is in accord with established policy in commercial navigation projects.

Industrial Harbor at Red Wing, Minn.

(H. Doc. No. 32, 86th Cong.)

1. *Recommended project.*—The recommended project provides for enlargement of the harbor at Red Wing, Minn., by dredging a basin averaging 300 feet in width and 1,200 feet in length, at a depth of 9 feet below project pool level, in an area west of the existing industrial harbor. This improvement will meet the needs of established and prospective navigation.

2. *First cost.*—The estimated first cost of the recommended project, based on prices and conditions existing in 1957, is as follows:

Federal	$170,400
Non-Federal	31,000
Total	201,400

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$6,020	$1,100	$7,120
Maintenance dredging [1]	1,800		1,800
Maintenance of navigation aids	150		150
Total	7,970	1,100	9,070
Average annual benefits:			
Transportation savings			11,880
Land enhancement			580
Total			12,460
Ratio of benefits to costs			1.4

[1] Maintenance of entire commercial harbor.

Analysis on the basis of an economic life greater than 50 years would be conjectural and would not influence selection of facilities required to serve established and prospective navigation.

4. *Apportionment of costs.*—Project costs are apportioned between the Federal Government and local interests in accordance with normal practice for commercial navigation improvements. Estimated local costs include $24,000 for clearing and grading of a terminal site, provision of an access road, and utility modifications; $3,000 for lands and rights-of-way; and a cash contribution of $4,000 in recognition of the enhancement benefit which would be realized as a result of the improvement.

5. *Discussion.*—The Federal projects serving Red Wing, Minn., provide for a 9-foot channel in the Mississippi River and a harbor for small boats. Local interests have dredged a terminal area adjacent to the right bank of the river and west of small-boat harbor, and have constructed barge loading and unloading facilities along the waterfront. Increased use of the facilities for commercial navigation provided by local interests has resulted in congestion in the movement of barges and lack of storage space for coal. The recommended harbor extension provides the most logical means of eliminating congestion in the movement of barges. Spoil for the project dredging will be placed so as to raise approximately 18 acres of land to the level of the highest flood of record. This land is adjacent to the railroad right-of-way and easily accessible from the highway, and when raised will be suitable for terminal development. The recommended improvement will effectively serve existing and prospective commerce and will not preclude later enlargement of the harbor should the need for this arise.

Menominee Harbor and River, Mich. and Wis.

(H. Doc. 113, 86th Cong.)

1. *Recommended project.*—The recommended project provides for modification of the existing project for Menominee Harbor and River, Mich. and Wis., to provide for a depth of 26 feet in the approach channel from that depth in Green Bay to a point 400 feet inside the entrance piers, thence a depth of 24 feet to the end of the existing deep-draft channel at the Marinette municipal wharf, with no change in the authorized widths; and an enlargement of the existing turning basin by dredging an additional 2 acres to a depth of 21 feet. These works will permit deeper loading of vessels using the harbor and will eliminate delays in turning the larger vessels.

2. *First cost.*—The estimated first cost of the recommended project, based on prices and conditions existing in 1958, is as follows:

Federal	$715,000
Non-Federal	52,000
Total	767,000

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and interest rates of 2.5 percent for public expenditures and 4 percent for nonpublic expenditures, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$25,500	$2,500	$28,000
Additional maintenance	4,000		4,000
Total	29,500	2,500	32,000
Average annual benefits:			
Deeper vessel loading			27,200
Elimination of delay			8,100
Total			35,300
Ratio of benefits to costs			1.1

Analysis on the basis of an economic life substantially in excess of 50 years would be highly conjectural because of the difficulties involved in long-range projection of traffic patterns and trends in vessel development. The recommended improvement will not preclude future enlargement or extension of the project should the need arise.

4. *Apportionment of costs.*—Project costs are apportioned between the Federal Government and local interests in accordance with normal procedures for commercial navigation improvements. The local share of the first costs includes $51,000 for dredging in berthing and docking areas and $1,000 for rights-of-way.

5. *Discussion.*—The recommended deepening of the existing approach and channel up to the Marinette municipal wharf will permit more efficient movement of existing and prospective inbound traffic in coal and limestone by permitting deeper vessel loading. Deepening of the existing turning basin is not necessary because the vessels using this facility may do so after unloading their cargoes thus requiring depths substantially less than are needed in the channel to be improved. The recommended enlargement of the turning basin, however, will reduce delays in turning the larger vessels using the harbor. Upstream extension of the deep draft channel cannot be justified on the basis of prospective traffic. There are no practicable alternatives to the improvements recommended.

Kewaunee Harbor, Wisconsin

(Senate Doc. 19, 86th Cong.)

1. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Kewaunee Harbor, Wis., to provide for enlarging the turning basin by removing the southerly 100 feet of Fishermen's Point to a depth of 20 feet; dredging a channel 100 feet wide and 20 feet deep for a distance of 620 feet from the north limit of the turning basin to the north basin; and dredging to a depth of 20 feet in the north basin over widths increasing from 100 feet in the channel to 500 feet in the northerly part of the basin.

2. *First cost.*—The estimated first cost of the recommended work, based on prices and conditions as of 1958, is as follows:

Federal	[1] $82,500
Non-Federal	1,000
Total	83,500

[1] Includes $600 for navigation aids.

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$3,040	$100	$3,140
Maintenance	2,060		2,060
Total	5,100	100	5,200
Average annual benefits: Transportation savings			15,200
Ratio of benefits to costs:			
Enlargement of turning basin			8.8
Extension into north basin			1.2
Entire recommended improvement			2.9

Analysis on the basis of an economic life in excess of 50 years would be conjectural and would not influence selection of facilities to serve existing and prospective commerce.

4. *Apportionment of costs.*—The costs of the recommended improvement are apportioned in accordance with normal procedures for commercial navigation improvements. The estimated non-Federal first cost is for rights-of-way for the turning basin enlargement.

5. *Discussion.*—The recommended improvement comprises a logical means of reducing delays to vessels and eliminating need for tug service. It will be economically justified by a comfortable margin. Although further improvement of the harbor was not found to be justified the recommended improvement would not preclude later deepening or extension should the need arise.

Two Harbors, Minn.

(H. Doc. 146, 86th Cong.)

1. *Navigation problem.*—Existing project depths of 26 and 28 feet are not adequate for full loading of iron ore vessels drawing 25.5 feet permitted by the Great Lakes connecting channels project. Local interests desire deepening to 28 and 30 feet, and also shifting the westerly breakwater southward to increase the maneuvering area.

2. *Solutions considered.*—In addition to deepening (par. 3), consideration was given to moving the westerly breakwater and increasing the height of the east breakwater. Neither of these modifications was found justified by resulting benefits. No specific difficulties to navigation or damages to vessels were cited by local interests to support breakwater modifications, and larger vessels are expected to use the deepened harbor without difficulty.

3. *Plan of improvement.*—The proposed plan of improvement provides for deepening the 26- and 28-foot depths in the existing project area to 28 and 30 feet, respectively. Estimated first and annual costs and annual benefits, based on August 1958 prices, a 50-year project life, and 2½-percent interest rate, are as follows:

Item	Federal	Non-Federal	Total
1st costs: Dredging	[1] $169,500	$46,000	[1] $215,500
Annual costs:			
Interest	4,200	1,800	6,000
Amortization	1,700	300	2,000
Total annual costs	[2] 5,900	2,100	[3] 8,000
Annual benefits: Iron ore			543,000
Benefit-cost ratio			[3] 68.0

[1] Includes $7,500 for preauthorization surveys.
[2] No increase in Federal cost of maintenance.
[3] Prior to allocation of benefits to connecting channels.

4. *Apportionment of costs.*—The only costs assigned to local interests are for dredging local berthing areas. The report provides that local interests agree to:

(*a*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required;

(*b*) Hold and save the United States free from damages due to the construction and maintenance of the improvement; and

(*c*) Provide and maintain depths in berthing areas adjacent to the iron ore docks commensurate with the depths provided in the project area.

5. *Discussion.*—Final determination of the benefit-cost ratio for the system of harbors and connecting channels, estimated in Senate Document No. 71, 84th Congress, to have a benefit-cost ratio of 1.78, must await completion of the other harbor studies in progress. However, Two Rivers Harbor is an integral part of the system. Deepening of the harbor as proposed is obviously justified and would enhance the justification of the entire system.

Duluth-Superior Harbor, Minn. and Wis.

(H. Doc. 150, 86th Cong.)

1. *Navigation problem.*—Existing project depths in Duluth-Superior Harbor, varying from 26 feet in the outer harbor basins to 25 feet in the Cross Channel and in a section of North Channel, are inadequate to permit full loading to drafts of 25.5 feet of bulk cargo vessels that will use the Great Lakes connecting channels and the St. Lawrence Seaway. Duluth-Superior Harbor is a major port for shipping iron ore from the northern Minnesota iron ranges, and for substantial movements of grain, coal, stone, and other bulk commodities. Local interests variously desired deepening of channels and basins to 27 or 30 feet; widening of channels and basins; and bridge modifications to ease vessel maneuvering.

2. *Solutions considered.*—Improvements considered were limited to those that would primarily serve vessels transporting iron ore. Other improvements will be considered in the final consolidated report on Great Lakes Harbors.

3. *Proposed plan of improvement.*—The proposed plan of improvement would modify the existing project for Duluth-Superior Harbor to provide for a depth of 32 feet in the lake approach to the Duluth entry, decreasing within the canal to 28 feet at the Duluth Harbor Basin; a depth of 28 feet in the northern part and 27 feet in the southern part of the Duluth Basin; a depth of 32 feet in the lake approach to the Superior entry, decreasing within the entry to 27 feet at the Superior Harbor Basin; and a depth of 27 feet in the Superior Basin, Superior Front Channel, East and West Gate Basins, the eastern half of South Channel, Cross Channel, and a section of North Channel abutting Cross Channel. Estimated first and annual costs and annual benefits, based on June 1958 prices, a 50-year project life, and 2½ percent Federal and 4 percent non-Federal (private) interest rates, are as follows:

Item	Federal	Non-Federal	Total
First costs	[1] $2,375,500	$172,500	[1] $2,548,000
Annual costs:			
Interest	59,400	6,900	
Amortization	24,400	1,100	
Total annual costs	83,800	8,000	91,800
Annual benefits:			
Iron ore			1,650,000
Grain			51,000
Stone			74,000
Total annual benefits			1,775,000
Benefit-cost ratio			[2] 19.3

[1] Includes $11,500 for preauthorization studies.
[2] Prior to allocation of benefits to the connecting channels.

Analysis on the basis of a 100-year project life and 2½ percent Federal and 4 percent non-Federal interest rates would increase the benefit-cost ratio slightly, assuming that the estimated benefits would be obtainable throughout the second half of the 100-year period. The favorable conclusions would not be affected.

4. *Apportionment of costs.*—The only costs allocated to local interests are those for dredging outside of Federal project limits at the iron ore, grain, and limestone docks. The report requires that local interests agree to:

(*a*) Furnish without cost to the United States all lands, easements, rights-of-way, and spoil-disposal areas necessary for construction and subsequent maintenance, when and as required;

(*b*) Hold and save the United States free from damages due to the construction and maintenance of the improvement; and

(*c*) When and where needed, provide and maintain depths in the berthing areas adjacent to the terminals commensurate with the depths provided in the related project areas.

5. *Discussion.*—The proposed improvement of Duluth-Superior Harbor is economically justified, and would enhance the justification of the entire system of Great Lakes harbors and connecting channels of which it is an integral part.

Duluth-Superior Harbor, Minn. and Wisc.

(Second Interim Report)

(H. Doc. 196, 86th Cong.)

1. *Recommended project.*—The recommended project provides for modification of the existing project for Duluth-Superior Harbor to provide for—

(*a*) A depth of 27 feet in Allouez Bay channel within presently authorized limits.

(*b*) A depth of 27 feet in Howards Bay channel within presently authorized limits.

(*c*) A depth of 27 feet in North Channel between West Gate Basin and Cross Channel within presently authorized limits.

(*d*) A depth of 27 feet in 21st Avenue West Channel with widening to 200 feet for a distance of 2,500 feet from the North Channel.

(*e*) A depth of 23 feet in the South, Upper, and Minnesota Channels, between the Cross Channel and the vicinity of the Interlake Iron Corp. (Zenith plant) dock, and widening from the presently authorized width of 400 feet to a width of 600 feet opposite the Interlake Iron Corp., Duluth Dock & Transport Co., and Inland Coal & Dock Co. slips.

2. *First costs.*—The estimated first costs of the recommended project, based on prices and conditions existing in October 1958, are as follows:

Channel	Federal	Non-Federal	Total
Allouez Bay	$98,000	$40,000	$138,000
Howards Bay	911,000	266,000	1,177,000
North and 21st Ave. West	718,000	159,000	877,000
South, Upper, Minnesota	786,000	91,000	877,000
Total first costs	2,513,000	556,000	3,069,000
Preauthorization study cost	23,000	0	23,000
Total investment	2,536,000	556,000	3,092,000

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and interest rates of 2.5 percent for Federal expenditures and 4 percent for non-Federal expenditures, are as follows:

Average annual costs

Channel	Federal	Non-Federal	Total
Allouez Bay	$3,000	$2,000	$5,000
Howards Bay	32,500	12,500	45,000
North and 21st Ave. West	25,600	7,400	33,000
South, Upper, Minnesota	28,000	4,200	32,200

Average annual benefits

Channel	Transportation savings	Ship repair savings	Total
Allouez Bay	$115,000	0	$115,000
Howards Bay	249,000	$60,000	309,000
North and 21st Ave. West	522,000	0	522,000
South, Upper, Minnesota	128,000	0	128,000

Ratios of benefits to costs

Channel:	*Benefit-cost ratio*
Allouez Bay	23.0
Howards Bay	6.9
North and 21st Ave. West	15.8
South, Upper, Minnesota	4.0

4. *Apportionment of costs.*—In view of the general nature of the benefits to be realized from the overall improvement, all costs for dredging the channels will be borne by the United States. Costs for modification of berthing areas, access channels, and other work associated with the project will be borne by local interests.

5. *Discussion.*—In the first interim report on Duluth-Superior Harbor, House Document 150, 86th Congress, the channels and basins which are used primarily for iron ore commerce in the Federal navigation project were recommended for deepening to a minimum depth of 27 feet to be commensurate with the depths being provided or proposed in the Great Lakes connecting channels and the principal lower lakes harbors. There is considered in the second interim report of the Great Lakes harbors study on Duluth-Superior Harbor the advisability, in the interest of grain, coal, and limestone commerce, of undertaking deepening of additional channels which join the channels previously recommended for deepening at this harbor. The studies of prospective traffic made in connection with the overall Great Lakes harbors study indicate that over the next 50 years annual averages of 3,700,000 tons of grain, 6,650,000 tons of coal, and 1,600,000 tons of limestone will be handled through the harbor, portions of which would be shipped or received through terminals on the channels proposed for improvement in this report. There is need and economic justification for deepening and improving channels at Duluth-Superior Harbor to effect fuller utilization of the larger, more efficient vessels of the Great Lakes fleet in the bulk cargo traffic at this harbor. Project formulation studies considered channel depths for grain of both 25 feet and 27 feet and 23 feet and greater depths for coal. The depth of 27 feet was found justified for grain traffic in view of the connecting channel and seaway depths but a depth of 23 feet for coal traffic was found adequate for the foreseeable future. The effect of evaluation of the feasibility of the recommended plan of improvement using an amortization period substantially in excess of 50 years, while conjectural because of the difficulty in projecting long-range traffic patterns and trends in vessel development, is not considered to be sufficient to result in a change in the scope of the project or the basis for cost-sharing arrangements. The recommended improvement will not preclude future enlargement or extension of the project should the need arise. The plan proposed in the second interim report on Duluth-Superior Harbor comprises deepening and modification of Allouez Bay Channel, Howards Bay Channel, North Channel, 21st Avenue West Channel to 27 feet and South, Upper, and Minnesota Channels to 23 feet at a total estimated cost to the United States of $2,513,000 for construction, subject to certain conditions of local cooperation.

Ashland Harbor, Wis.

(H. Doc. 165, 86th Cong.)

1. *Navigation problem.*—Existing project depth of 25 feet in the East Basin is not adequate to permit vessels calling at Ashland for iron ore to load to the maximum safe draft of 25.5 feet permitted by the Great Lakes connecting channels project. The project depth of 20 feet in the inner section of the West Channel is also inadequate for prospective movements of coal to the power company dock. Local interests desire deepening to 27 feet and other project modifications.

2. *Solutions considered.*—Deepening to provide adequate depths for the iron ore and coal traffic were the only improvements considered in this report.

3. *Plan of improvement.*—The proposed plan of improvement would modify the existing project for Ashland Harbor, Wis., to provide for a depth of 27 feet in the westerly part of the East Basin and approach thereto over a distance of 6,000 feet from deep water to a line 75 feet outside the harbor line, for widths varying from 1,500 feet at the lakeward end to 2,200 feet near the harbor line; and 21 feet in West Channel over a width of 400 feet and a distance of 2,000 feet from the westerly limit of the existing 21-foot section. Estimate of first and annual costs and annual benefits, based on August 1958 price levels, a 50-year project life, and 2½ percent Federal and 4 percent non-Federal (private) interest rates, are as follows:

East Basin

	Federal	Non-Federal	Total
1st costs	[1] $1,247,000	$35,000	[1] $1,282,000
Annual costs:			
Interest	31,200	1,400	
Amortization	12,800	200	
Increased maintenance	[2] 2,000		
Total annual costs	46,000	1,600	47,600
Annual benefits (iron ore)			103,800
Benefit-cost ratio			[3] 2.2

[1] Includes $6,000 for preauthorization studies and $5,000 for aids to navigation.
[2] Includes $500 for maintenance of aids to navigation (Coast Guard).
[3] Prior to allocation of benefits to connecting channels.

West channel

Item	Federal	Non-Federal	Total
1st costs	[1] $261,300	$172,500	[1] $433,800
Annual costs:			
Interest	6,500	6,900	
Amortization	2,700	1,100	
Increased maintenance	[2] 600		
Total annual costs	9,800	8,000	17,800
Annual benefits (coal)			65,000
Benefit-cost ratio			3.6

[1] Includes $1,500 for preauthorization surveys and $800 for aids to navigation.
[2] Includes $100 for maintenance of aids to navigation (Coast Guard).

NOTE.—The overall benefit-cost ratio for the combined improvement is 2.6.

Analysis on the basis of a 100-year life and 2½ percent Federal and 4 percent non-Federal (private) interest rates, would increase the benefit-cost ratios slightly, assuming no change in the expected benefits in the second half of the 100-year period. The favorable conclusions would not be affected.

4. *Apportionment of costs.*—The only costs assigned to local interests are those for dredging berthing areas at the iron ore and coal docks, shoreward of Federal project limits. The report requires that local interests agree to: (*a*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required; (*b*) hold and save the United States free from damages due to construction and maintenance of the improvement; and (*c*) provide and maintain depths in berthing areas adjacent to the iron ore and Lake Superior District Power Co. docks commensurate with the depths provided in the project areas.

5. *Discussion.*—The proposed modification of the Ashland Harbor project, as stated herein, is economically justified. It would contribute materially to the value ot the system of Great Lakes harbors and connecting channels of which it is an integral part.

PRESQUE ISLE HARBOR, MICH.

(H. Doc. 145, 86th Cong.)

1. *Navigation problem.*—Existing minimum project depths of 26 and 28 feet below low-water datum are inadequate to permit full loading of iron ore vessels that will utilize the Great Lakes connecting channels and the St. Lawrence Seaway. The connecting channels project and the seaway will permit maximum safe drafts of 25.5 feet, requiring minimum depths stated in paragraph 3.

2. *Solutions considered.*—Since the only problem is whether to provide project dimensions consistent with those of the connecting channels and the seaway, the only plan considered is that in paragraph 3.

3. *Plan of improvement.*—Modify the existing project for Presque Isle Harbor, Mich., to provide for a depth of 28 feet in the inner part of the project area, and 30 feet in the outer part, with minor alteration of the project limits. Estimated first and annual costs and annual benefits, based on June 1958 prices, a 50-year project life, and 2½ percent interest rate, are as follows:

Item	Federal	Non-Federal	Total
1st costs, dredging	[1] $222,800	$23,000	[1] $245,800
Annual costs:			
Interest	5,570	920	6,490
Amortization	2,290	150	2,440
Total annual costs	[2] 7,860	1,070	[2] 8,930
Annual benefits, iron ore			230,800
Benefit-cost ratio			[3] 25.8

[1] Includes $7,500 for preauthorization survey.
[2] No increase in Federal maintenance costs.
[3] Prior to allocation of benefits to connecting channels.

Analysis on the basis of a 100-year life and 2½ percent interest rate would increase the benefit-cost ratio slightly.

4. *Apportionment of costs.*—The only costs allocated to local interests are those for dredging local berthing areas alongside the iron ore docks. The report recommends that local interests agree to:

(*a*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required;

(*b*) Hold and save the United States free from damages due to the construction and maintenance of the improvement; and

(*c*) Provide and maintain depths in berthing areas adjacent to the iron ore pier commensurate with the depths provided in the project area.

5. *Discussion.*—Final determination of the benefit-cost ratio for the system of harbors and connecting channels, estimated in Senate Document No. 71, 84th Congress, to have a benefit-cost ratio of 1.78, must await completion of the other harbor studies in progress. However, the deepening of Presque Isle Harbor as proposed is obviously justified and would enhance the justification of the entire system.

MARQUETTE HARBOR, MICH.

(H. Doc. 154, 86th Cong.)

1. *Navigation problem.*—The existing project depth of 25 feet is not adequate to permit full loading of iron ore vessels to the maximum safe draft of 25.5 feet permitted by the Great Lakes connecting channels project.

2. *Considered solutions and plan of improvement.*—The only plan of improvement considered in this report was deepening the existing project area behind the breakwater to 27 feet. Local interests would be required to deepen dockside berthing areas to comparable depths. Estimated first and annual costs and an-

nual benefits, based on June 1958 price levels, a 50-year project life, and 2½ percent Federal and 4 percent non-Federal (private) interest rates, are as follows:

Item	Federal	Non-Federal	Total
1st costs	[1] $242,500	$12,000	[1] $254,500
Annual costs:			
Interest	6,100	500	
Amortization	2,500	100	
Total annual costs	8,600	600	9,200
Annual benefits (iron ore)			23,700
Benefit-cost ratio			[2] 2.6

[1] Includes $6,500 for preauthorization studies.
[2] Prior to allocation of benefits to the connecting channels.

Analysis on the basis of a 100-year life, and the same interest rates as above, would increase the benefit-cost ratio slightly, but would not affect the evident justification of the recommended improvement.

3. *Apportionment of costs.*—The only costs for the proposed plan assigned to local interests are for deepening at the iron ore dock. The report requires that local interests agree to:

(*a*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required;

(*b*) Hold and save the United States free from damages due to the construction and maintenance of the improvement; and

(*c*) Provide and maintain depths in berthing areas adjacent to the iron ore pier commensurate with the depths provided in the project area.

4. *Discussion.*—Improvement of Marquette Harbor as proposed is economically justified, and would enhance the justification of the system of Great Lakes harbors and connecting channels of which it is an integral part.

Calumet Harbor, Ill. and Ind.

(H. Doc. 149, 86th Cong.)

1. *Navigation problem.*—This report concerns improvement of the outer harbor and lower river sections of Calumet Harbor in the primary interest of iron ore commerce.

2. Calumet Harbor is at the mouth of Calumet River which enters Lake Michigan at the State line between Illinois and Indiana about 12.5 miles southeast of Chicago Harbor, Ill., and 7 miles northwest of Indiana Harbor, Ind. The harbor consists of a breakwater-protected outer harbor, and the lower section of Calumet River to turning basin No. 5 at the entrance of Lake Calumet, 5.75 miles from the outer harbor. Above this the river is a part of the Illinois Waterway improved for barge navigation. Calumet River is crossed by 14 bridges below Lake Calumet, but none of these cross the harbor section considered in this report. The existing Federal project provides for an outer harbor protected by a breakwater 12,500 feet long; an approach channel 3,200 feet wide and 28 feet deep; an outer harbor channel and anchorage 3,000 feet wide and 26 feet deep; a channel in the river 350 feet wide and 26 feet deep up to the Elgin, Joliet & Eastern Railway bridge, thence at least 200 feet wide and 25 feet deep to 111th Street, 23 feet to 114th Street, 21 feet to 122d Street, and 21.5 feet to and including turning basin No. 5; widening and straightening the river channel to within 20 feet of bulkhead lines; and five turning basins along the river, each of adequate size for lake vessels and with the same depth as the adajcent channel. The existing project work is about 45 percent complete. Local interests have developed terminals and berthing slips in the lower river and harbor area for bulk lake commerce, have improved sections of Calumet River, and have expended some $24 million on initial phases of a terminal development on Lake Calumet for grain and general domestic and foreign commerce. The harbor is affected by

surface fluctuations of Lake Michigan which have ranged from a high monthly mean stage of 5.18 feet above to a low of 1.15 feet below the low water datum of 578.5 feet. Monthly means within any year have varied up to 2.2 feet, and wind and barometric pressure variations have caused temporary level changes of several feet. The harbor entrance is exposed to northeast storms over a fetch of 300 miles.

3. Calumet Harbor serves a major industrial section within the city of Chicago and its metropolitan area. This area has an estimated population of 6,183,000. Several major steel plants, grain elevators, and a number of other industries utilizing water transportation services are situated in the Harbor and Lake Calumet areas. Waterborne receipts and shipments at Calumet Harbor and River and Lake Calumet for the years 1948 through 1957 averaged 22,140,348 tons annually of which 46 percent was iron ore, 12 percent, limestone; 25 percent, coal; 8 percent, grain; and 9 percent, miscellaneous commodities. In addition, traffic passing through the harbor has averaged 404,000 tons annually over the same 10-year period. About 75 percent of the iron ore and 52 percent of the limestone tonnages are received in the harbor section considered for improvement in this report. During the next 50 years, iron ore receipts in this harbor section are expected to average 14,257,000 tons and limestone receipts 2,192,000 tons annually. In 1957, vessels made 16,216 trips in and out of the harbor, of which 696 trips were made by vessels having drafts of 21 through 24 feet.

4. The major difficulty attending navigation of significance in relation to the matters with which this report is concerned is the lack of sufficient depth to accommodate vessels which will use the connecting channels and St. Lawrence Seaway. Existing commerce on Calumet River landward of the Elgin, Joliet & Eastern Railway bridge is handicapped by inadequate widths, numerous sharp bends, and the restrictive character of some of the bridges crossing the river. Improvements in this reach of Calumet River will be considered in a subsequent report.

5. Local interests desire a depth of 27 feet in Calumet Harbor and the channel from Lake Michigan to and including the port area in Lake Calumet; widening of the Calumet River channel to 300 feet; replacement of three obstructive railroad bridges; enlargement and deepening of turning basin No. 3; and closure of the breakwater gap as previously authorized. The various interests concerned point out that a major share of the bulk freighters calling at the port could be loaded to drafts greater than those permitted by existing project depths, and that the growth of basic iron, steel, and other industries in the area require extension of the deep-draft channel to meet their needs.

6. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Calumet Harbor and River, Ill. and Ind., to provide for a depth of 29 feet in the lake approach, 28 feet in the outer harbor, and 27 feet in the river entrance up to the Elgin, Joliet & Eastern Railway bridge; all generally in accordance with the plan of the district engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of $5,240,000 for construction dredging, with no increase in the estimated annual cost of maintenance; provided that local interests agree to (*a*) hold and save the United States free from damages due to the construction and maintenance of the improvement; and (*b*) provide and maintain depths in berthing areas adjacent to the iron ore and stone docks commensurate with the depths provided in the project area.

7. *First costs.*—The estimated first costs of the recommended improvement, based on prices and conditions existing in 1958, are as follows:

Federal:	
Construction	$5, 240, 000
Preauthorization study	15, 000
Subtotal	5, 255, 000
Non-Federal	[1] 5, 000
Total	5, 260, 000

[1] For dredging of dockside areas.

8. *Annual costs and benefits.*—Annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and interests rates of 2.5 and 4 percent for Federal and non-Federal investments are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$192,200	$200	$192,400
Maintenance [1]			
Total	192,200	200	192,400
Average annual benefits: Transportation savings in movement of iron ore and limestone in a more efficient fleet of larger vessels which will use the Great Lakes channel and harbor improvements			1,328,500
Ratio of benefits to costs			6.9

[1] There would be no increase in the present cost of maintenance as a result of the recommended improvement.

9. The improvements proposed would permit the prospective fleet of bulk cargo carriers to use this harbor when loaded to the full drafts permitted by the Great Lakes connecting channels. In Senate Document No. 71, 84th Congress, the system of harbors and connecting channels was estimated to have a benefit-cost ratio of 1.78. Current studies indicate that the system ratio will be greater than estimated at that time. Final determination of the benefit-cost ratio for the system must await completion of the other harbor studies now in progress. However, it is clear from the present report that improvement of Calumet Harbor and River is economically justified, and it would contribute materially to the value of the system of which it is an integral part.

10. Alternative analysis on the basis of an economic life of 100 years would be conjectural and has not been made. It is unlikely that such analysis would provide a basis for selection of facilities different than those recommended. Provision of the recommended facilities would not preclude additional improvement should the need arise.

11. *Apportionment of costs.*—The recommended local cooperation and apportionment of costs are in accordance with long standing Federal policy for commercial navigation projects. Local interests have indicated that they will meet the requirements of local cooperation.

INDIANA HARBOR, IND.

(H. Doc. 195, 86th Cong.)

1. *Recommended project.*—The recommended project provides for increasing the authorized project depths in Indiana Harbor to 29 feet in the outer harbor entrance channel, to 28 feet in the outer harbor, and to 27 feet in the canal entrance channel to the first Elgin, Joliet & Eastern Railway bridge. Channel widths to be 800 feet in the entrance channel to the outer harbor, and 290 feet in the canal entrance channel up to the aforementioned railway bridge. These improvements will provide navigation depths commensurate with those being provided in the Great Lakes connecting channels. They will permit deeper loading of vessels using the harbor, particularly those carrying iron ore and limestone.

2. *First cost.*—The estimated first cost of the recommended project, based on December 1958 price levels, is as follows:

Federal	[1] $974,000
Non-Federal	32,000
Total	[1] 1,006,000

[1] Exclusive of cost of $12,000 already incurred for preauthorization studies.

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, based on an economic life of 50 years and interest rates of 2½ percent on Federal expenditures and 4 percent on non-Federal private expenditures, would be as follows:

Average annual costs:	
Federal	$35,700
Non-Federal	1,500
Total	37,200
Average annual benefits	1,012,100
Ratio of benefits to costs	27 to 1

4. *Apportionment of costs.*—Because of the general nature of the benefits to be realized from the recommended improvement, all costs for dredging the channels and outer harbor will be borne by the United States. Costs for deepening berthing areas will be borne by local interests.

5. *Discussion.*—The recommended plan of improvement was found to be economically justified and is considered to provide for the present and anticipated needs of navigation, and further to provide generally for the desires of local interests regarding improvement of the outer harbor. The recommended deepending will permit full-draft loading of vessels delivering iron ore and limestone to docks on the outer harbor. Alternative lesser depths were not considered for this part of the project, because of the relatively small increments of deepening represented (1 and 2 feet over existing project depths). There are no other practicable alternatives to the recommended plan.

6. Economic analysis on the basis of an economic life significantly greater than 50 years would be highly conjectural because of the difficulties involved in long-range projection of traffic patterns and trends in vessel development. The effect of using a longer economic life is not considered to be sufficient to result in a change in the scope of the project or the basis for apportionment of costs. The recommended improvement will not preclude future enlargement of the project should the need arise.

7. A second interim report, to include Indiana Harbor landward of the section currently being recommended for improvement, will be made subsequently in preparation of the comprehensive Great Lakes Harbors study. It will consider provision of a channel depth of 27 feet up to the upper limits of the Federal project as presently authorized.

Toledo Harbor, Ohio

(H. Doc. 153, 86th Cong.)

1. *Navigation problem.*—This report concerns improvement of Toledo Harbor in the primary interest of iron ore commerce.

2. Toledo Harbor, Ohio, at the westerly end of Lake Erie, is on the Maumee River which empties into Maumee Bay, a shallow arm of the lake. The existing Federal project provides for a channel 25 feet deep and 500 feet wide from deep water in Lake Erie to the mouth of the Maumee River; for a channel 25 feet deep in Maumee River to mile 6.9, 400 feet wide from the mouth to the Fassett Street Bridge, mile 6.2, and 200 feet wide above that point; a triangular widening at the bend in the channel at the mouth of the river, on the north side of the channel opposite the Chesapeake and Ohio Railway dock and the Lakefront Terminal dock, 7,315 feet in length, 460 feet in maximum width and 38.6 acres in area; and turning basins, one about 3 miles upstream opposite the American Shipbuilding Co. with an area of about 5 acres and a depth of 20 feet, and the other at the upper end of the project with an area of 8.25 acres and a depth of 18 feet; and for removal of the center dike on which the Maumee Bay Range Lights are located. The existing project, exclusive of the channel widening at the mouth and the turning basin, 3 miles upstream, was completed in 1957. Local interests have provided iron ore, grain, and coal docks and other terminal facilities. The lake level is subject to annual fluctuations up to 2.75 feet, generally above the low water datum of 570.5 feet. In addition, winds and barometric pressure variations cause temporary changes in water level between extremes of 6.5 feet above and 7.5 feet below the normal level. The authorized project is crossed by eight bridges.

3. Toledo Harbor is primarily a transshipment point, its waterborne commerce consisting mostly of the shipment of coal and petroleum and its products to lake ports of the United States and Canada and the receipt of iron ore from the Lake Superior region. Grain transported by rail and truck to Toledo is transshipped by vessel to other Great Lakes and Canadian ports. Waterborne commerce at Toledo Harbor for the years 1947 through 1956 averaged 31,071,970

tons, of which 23,691,005 tons were coal and coke, 3,969,014 tons were iron ore, and 2,568,577, 104,684, and 738,690 tons were petroleum, grain, and miscellaneous commodities, respectively. During the next 50 years, iron ore receipts are expected to average 7,501,000 tons annually; coal shipments, 50 million tons; and grain shipments, 1 million tons. In 1956, vessels made 13,061 trips in and out of the harbor, of which 431 were inbound and 1,176 were outbound trips by vessels having drafts of 21 through 25 feet.

4. The major difficulty attending navigation of significance in relation to the matters with which this report is concerned is the lack of adequate depth to accommodate vessels which will use the improved connecting channels and the St. Lawrence Seaway. Uncompleted portions of the existing project provide for turning and manuevering areas which will alleviate difficulties in turning vessels at the Lakefront and Chesapeake & Ohio docks in Maumee Bay and at the American Shipbuilding Co. dock in the Maumee River. Local interests desire deepening of Toledo Harbor to 27 feet. The Toledo-Lucas County Port Authority, a public body empowered to develop watercourses and acquire property and construct facilities at the port of Toledo, has indicated its willingness and financial and legal ability to meet the requirements of local cooperation.

5. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Toledo Harbor, Ohio, to provide an entrance channel extending from deep water in Maumee Bay to the mouth of the river, 500 feet wide and 28 feet deep, including deepening of the authorized widening opposite the Chesapeake & Ohio Railroad and the Lakefront Terminal docks; a channel extending from the mouth of the Maumee River to a point about 3 miles upstream, 400 feet wide and 27 feet deep, including enlargement of the authorized turning basin at the upstream end of this section to a width of 750 feet and a depth of 20 feet; and thence a channel about 3 miles long, extending upstream to the New York Central Railroad bridge, 200 feet wide and 27 feet deep, including a turning basin downstream of the Anthony Wayne Bridge, about 725 feet wide and 900 feet long, with a depth of 27 feet for the full 400-foot width of the presently authorized channel in this reach in the vicinity of those docks where a 27-foot approach channel and berthing area are provided by local interests; all generally in accordance with the plan of the district engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of $14,684,000 for construction dredging, with no increase in the annual cost of maintenance; provided that local interests agree to: (*a*) Provide without cost to the United States all lands, easements, rights-of-way, and spoil-disposal areas necessary for construction and subsequent maintenance, when and as required; (*b*) hold and save the United States free from damages due to the construction and maintenance of the improvement; (*c*) provide and maintain suitable depths in the areas adjacent to the iron ore receiving docks, including strengthening of docks where necessary, to accommodate the anticipated deep-draft iron ore traffic; and (*d*) construct a new Middleground grain terminal including elevators and dock, and construct and maintain an approach area necessary to utilize the proposed channel depth; and provided further, that the improvement may be undertaken by sections, working progressively upstream, whenever funds are available and the prescribed local cooperation has been furnished.

6. *First costs.*—The estimated first costs of the recommended improvement, based on prices and conditions existing in 1958, are as follows:

Federal:	
Construction	$14, 684, 000
Navigation aids	119, 800
Preauthorization studies	30, 000
Subtotal	(14, 833, 800)
Non-Federal	[1] 1, 320, 000
Total	16, 153, 800

[1] For dredging dock approaches and strengthening dock

7. *Annual costs and benefits.*—Annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and interest rates of 2.5 and 4 percent for Federal and non-Federal investments, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$535,400	$61,500	$596,900
Maintenance	[1] 4,200	0	4,200
Total	539,600	61,500	601,100
Average annual benefits: Transportation savings in movement of iron ore and grain in a more efficient fleet of larger vessels which will use the Great Lakes Channel and Harbor improvements			668,000
Ratio of benefits to costs			1.1

[1] Increased cost of maintenance of navigation aids. There will be no increase in cost of maintenance dredging.

8. The improvements proposed would permit the prospective fleet of bulk cargo carriers to use this harbor when loaded to the full drafts permitted by the Great Lakes connecting channels. In Senate Document No. 71, 84th Congress, the system of harbors and connecting channels was estimated to have a benefit-cost ratio of 1.78. Current studies indicate that the system ratio will be greater than estimated at that time. Final determination of the benefit-cost ratio for the system must await completion of the other harbor studies now in progress. However, it is clear from the present report that improvement of Toledo Harbor as proposed is economically justified, and it would contribute to the value of the system of which it is an integral part.

9. Alternative analysis on the basis of an economic life of 100 years would be conjectural and has not been made. It is unlikely that such analysis would provide a basis for selection of facilities different than those recommended. Provision of the recommended facilities would not preclude additional improvement should the need arise.

10. *Apportionment of costs.*—The recommended local cooperation and apportionment of costs are in accordance with long-standing Federal policy for commercial navigation projects.

11. *Discussion.*—The recommended improvements are located in three sections—the bay section, the lower river section, and the upper river section. Each section would be incrementally justified on its own merits, following provision of the downstream sections. Deepening upstream from the New York Central Railroad bridge is not considered necessary at this time in view of the limited prospective commerce requiring additional depth above the bridge. The plan of improvement selected is in general accordance with the desires of local interests and will comprise a logical and economically justified means of meeting navigation needs.

Sandusky Harbor, Ohio

(H. Doc. 144, 86th Cong.)

1. *Navigation problem.*—This report concerns improvement of Sandusky Harbor, Ohio, in the primary interest of coal commerce.

2. Sandusky Harbor is on the south shore of Lake Erie in the southeasterly part of Sandusky Bay. The existing Federal navigation project provides for the Outer and Straight Channels 400 feet wide and 21 feet deep, from Lake Erie to the waterfront docks; the Dock Channel along the waterfront 300 feet wide and 22 feet deep, ending in a turning basin generally 800 feet wide and 22 feet deep; maintenance of the Bay Channel to a depth of 22 feet extending northward from the turning basin and thence north eastward to the outer channel; and appurtenant works. Excluding cooperation in the existing Federal project, local interests have expended more than $5 million for improvement and maintenance of the harbor.

3. Commerce in the harbor averaged 9,493,000 tons from 1945 through 1956, about 98 percent of which was bituminous coal. During the next 50 years coal shipments from Sandusky Harbor are expected to average 15 million tons annually.

4. The present controlling depths in Sandusky Harbor channels are insufficient to accommodate modern vessels loaded with coal and desirous of using depths to be available in the connecting channels. The turning basin is too small for safe maneuvering. Local interests desire the deepening to 27 feet at low water datum of the Outer Bar Channel, the Straight Channel as far south as the southern side of the Bay Channel, the Bay Channel, and the turning basin; enlargement of the turning basin at the junction of the Dock and Bay Channels including the removal of about 250 feet of the westerly end of the rock dike paralleling the Dock Channel; extension of the Bay Channel westerly of the outer end of the Pennsylvania coal dock No. 3 and the provision of a turning basin; and widening of the 300-foot portion of the Bay Channel to 400 feet. Local interests point out the development of the 27-foot channel in the St. Lawrence Seaway and the Great Lakes connecting channels and the rapid fluctuations of the water level in Sandusky Harbor under certain weather conditions. They state that new vessels up to 730 feet in length, requiring a depth of 27 feet when loaded to capacity, are replacing the older vessels. They believe that two recent collisions in the turning basin warrant the removal of a portion of the west end of the rock dike. They further believe that because of unlimited fresh water and the existing channels in the harbor, the Sandusky area will not long be overlooked by firms seeking expansion, thus increasing demand for water transportation. They state that extension of Bay Channel westerly and provision of a turning basin is justified because it would make available for future expansion the west side of the strip of land on which the Pennsylvania Railroad coal dock No. 3 is located. Further, they believe the Bay Channel should be widened to 400 feet to accommodate two-way traffic and to conform with the width of the Straight and Outer Bar Channels. Local interests have indicated a willingness to cooperate in all improvements desired.

5. *Recommended improvement.*—The recommended improvement provides for modification of the existing Federal project to provide for (1) extending Outer Bar Channel and deepening that channel and the outer end of Straight Channel to 26 feet from deep water in the lake to the vicinity of Cedar Point dock; (2) widening the bend at the junction of the Outer Bar and Straight Channels and deepening to 26 feet; (3) deepening the Straight Channel to 25 feet from vicinity of Cedar Point dock to junction with Bay Channel; (4) deepening the Bay Channel from junction with the Straight Channel to the outer end of the Pennsylvania coal dock No. 3 to 25 feet, thence from outer end of the coal dock to the turning basin to 24 feet in soft material and 25 feet in hard, with no Federal dredging within 50 feet of the dock; and (5) enlarging the turning basin, including removal of approximately 300 feet of the rock dike, to the limits shown in the report of the district engineer with depths of 24 feet in soft material and 25 feet in hard; all generally in accordance with the plan of the district engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of $5,800,000 for construction and $30,000 annually for maintenance in addition to that now required; provided local interests agree to (*a*) furnish without cost to the United States all lands, easements, right-of-way, and spoil-disposal areas necessary for construction and subsequent maintenance, when and as required; (*b*) hold and save the United States free from damages due to the construction and maintenance of the project; and (*c*) deepen to project depth and maintain the areas adjacent to the coal docks and access thereto from the Federal improvement.

6. *First costs.*—The estimated first costs of the recommended improvement, based on prices and conditions existing in 1958, are as follows:

Federal:	
Construction	$5,800,000
Navigation aids	9,000
Preauthorization studies	17,000
Subtotal	5,826,000
Non-Federal	[1] 428,000
Total	6,254,000

[1] For dredging of dockside areas.

7. *Annual costs and benefits.*—Annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$210,600	$19,900	$230,500
Maintenance	[1] 30,900	[2] 2,500	33,400
Total	241,500	22,400	263,900
Average annual benefits:			
Transportation savings			956,500
Reduction in vessel damage			50,000
Total			1,006,500
Ratio of benefits to costs			3.8

[1] Includes $900 for maintenance of navigation aids.
[2] For maintenance dredging of dockside areas.

Analysis on the basis of an economic life of 100 years would be conjectural and would not influence selection of facilities needed to serve present and prospective commerce. Provision of the recommended improvement would not preclude later modification should the need arise.

8. *Apportionment of costs.*—The recommended local cooperation and apportionment of costs are in accordance with long standing Federal policy for commercial navigation projects.

9. *Discussion.*—The recommended improvement is adequate to provide reasonably safe and convenient accommodations for the largest lake vessels loaded with coal, and will be economically justified by a substantial margin. The navigation requirements in Sandusky Harbor are such that alternative improvements would not be practicable. A westerly extension of the Bay Channel to serve a contemplated terminal area west of the Pennsylvania coal dock No. 3, the widening of the Bay Channel to 400 feet, and their deepening to 27 feet are dependent upon potential traffic resulting from the St. Lawrence Seaway. These improvements will be considered in a subsequent report.

CLEVELAND HARBOR, OHIO

(H. Doc. 152, 86th Cong.)

1. *Navigation problem.*—Existing project depths, providing for a maximum depth of 23 feet in Cuyahoga River and Old River, are not adequate to permit vessels in the bulk commodity trades calling at inner and outer harbor terminals to load to the maximum safe drafts permitted by the Great Lakes connecting channels and the St. Lawrence Seaway projects. Narrow channel widths and bends also restrict use of the inner harbor to vessels less than 700 feet long. Local interests have requested deepening and widening of the river channels, and deepening of the east and west basins in the outer harbor.

2. *Solutions considered.*—Improvements considered in this report were limited to those described in paragraph 3. Study of further deepening and widening of Cuyahoga River above Old River, deepening Old River above the existing 23-foot section, and deepening the east basin would involve more time and expense than contemplated under the specific authority for the report, and will be accomplished under other available authority in the final consolidated report on Great Lakes Harbors.

3. *Proposed plan of improvement.*—The proposed plan of improvement provides for modification of the existing project for Cleveland Harbor, Ohio, to provide for a depth of 29 feet in the lake approach to the main entrance; 28 feet in the entrance channel to the lakeward ends of the piers at the mouth of Cuyahoga River; 27 feet in the river to a point just above its junction with Old River, and in Old River to the upstream limit of the present 23-foot project; 28 feet in the west basin within the existing project limits as modified to eliminate a triangular area at the west end and to extend the limits to a line parallel to and 75 feet from the harbor line; and 28 feet in the westerly 800 feet of the east basin. Estimated

first and annual costs and annual benefits, based on October 1957 prices, a 50-year project life, and a 2½-percent interest rate for Federal work and 4 percent for non-Federal private work (berthing areas and bulkheads), are as follows:

	Federal	Non-Federal	Total
1st costs:			
Channels and basins	[1] $2,501,200		[1] $2,501,200
Berthing areas and bulkheads		$2,869,500	2,869,500
Total 1st costs	2,501,200	2,869,500	5,370,700
Annual costs:			
Interest [2]	64,100	119,400	
Amortization [2]	26,300	19,500	
Increased maintenance	40,000	3,000	
Total annual costs	130,400	141,900	272,300
Annual benefits:			
Outer harbor: Iron ore			912,300
Old River: Iron ore, molding sand			323,400
Total annual benefits			1,235,700
Benefit-cost ratio			[3] 4.5

[1] Includes $15,200 for preauthorization survey.
[2] Includes charges on interest during construction period of 2 years.
[3] Prior to allocation of benefits to connecting channels.

Analysis on the basis of a 100-year life and 2½-percent Federal interest rate and 4-percent private rate for the Federal costs would increase the benefit-cost ratio slightly, but would not affect the conclusions on the report or the evident economic justification of the improvement.

4. *Apportionment of costs.*—The costs assigned to local interests are for berthing and terminal facilities outside the Federal project area but required to obtain the estimated benefits. These requirements are in accordance with those normally required in connection with Federal navigation projects. The report requires that local interests agree to—

(*a*) Furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required;

(*b*) Hold and save the United States free from damages due to the construction and maintenance of the improvements;

(*c*) Provide and maintain depths in areas between the channel limits and terminals commensurate with the depths provided in the adjacent project areas;

(*d*) Construct or strengthen bulkheads where necessary; and

(*e*) Accomplish alterations as required in sewer, water supply, and other utility facilities.

5. *Discussion.*—The proposed improvement of Cleveland Harbor is economically justified and will contribute materially to the value of the system of Great Lakes harbors and connecting channels of which it is an integral part.

Lorain Harbor, Ohio

(H. Doc. 166, 86th Cong.)

1. *Navigation problem.*—This report concerns improvement of Lorain Harbor in the intrest of deep-draft bulk commerce.

2. Lorain Harbor, Ohio, is on the south shore of Lake Erie about 28 miles west of Cleveland. The harbor includes the lower 3 miles of the Black River and some lake area at the river mouth. The existing Federal project, completed in 1951, provides for an outer harbor of 60 acres formed by converging rubble-mound breakwaters with an aggregate length of 6,350 feet and with an entrance 500 feet wide; 2 piers at the mouth of the river 300 feet apart, the westerly pier 1,003 feet long and the easterly pier 1,875 feet long; a channel 25 feet deep in soft material and 26 feet in hard material in the outer harbor and in the river for a distance of 2,200 feet from the outer ends of the piers, thence 24 feet in soft material and 25 feet in hard material to the upper end of the American Shipbuilding Co. drydock No. 2; thence a channel of the same depths and generally 200 feet wide, with

widening at the bends, to the upper end of the National Tube Co. dock; a turning basin 650 feet wide and 20 feet deep in the river bend above the Baltimore & Ohio Railroad coal dock; a basin 690 feet wide and 17 feet deep opposite the National Tube Co. dock; and an approach channel 16 feet deep from the outer harbor to the municipal pier. Prior to incorporation of the upper river section in the Federal project, the city of Lorain expended $1,600,000 in providing and maintaining a channel 20 feet deep over a distance of 2.25 miles to the National Tube Co. plant. Local interests have also constructed dock and terminal facilities. The harbor entrance, open to the northwest, is subject to heavy wave and current action and northerly storms cause considerable turbulence within the outer harbor. The harbor is affected by surface fluctuations of Lake Erie which in the past 98 years have ranged from a low monthly mean of 569.43 feet to a high of 574.70 as compared with the low-water datum of 570.5 feet. In addition, wind and barometric pressures cause temporary variations up to several feet. Two highway bridges and one railroad bridge cross the improved section of Black River.

3. The area tributary to Lorain Harbor consists of a commercial area extending over most of Lorain County which had a population of 148,162 in 1950, including 51,200 in the city of Lorain and 30,300 in the nearby city of Elyria. Major industries of the immediate area include a steel plant, shipyard, and railroad-owned coal and ore docks. The harbor is a shipping port for coal from eastern coalfields, and a receiving port for iron ore and stone destined for local and inland steel plants. Waterborne commerce at Lorain Harbor for the years 1947 through 1956 averaged 10,304,000 tons of which 6,495,000 and 785,000 tons were receipts of iron ore and stone, respectively, 2,715,000 tons were shipments of bituminous coal and 309,000 tons were miscellaneous commodity movements. During the next 50 years iron ore receipts are expected to average 7,422,000 tons annually; stone receipts, 2,414,000 tons, and coal shipments, 2,800,000 tons. In 1956, vessels, mainly bulk carrier types, made 2,742 trips in and out of the harbor of which 837 trips were made by vessels having drafts of 18 through 25 feet.

4. The existing project depths in the various harbor areas considered in this report are not commensurable to the depths currently being provided in the Great Lakes connecting channels and the St. Lawrence Seaway. In addition to the inadequate depths the harbor has restrictive features and a breakwater system not considered suitable for the needs of the present and prospective Great Lakes bulk-cargo fleet. Local interests desire extension of the east breakwater to the shore with a suitable gap for water circulation; construction of two detached breakwaters; removal of the lakeward 500 feet of the east pier; enlargment of the dredged area in the east part of the outer harbor; deepening of the outer harbor and lower 2,200 feet of river channel to 28 feet in soft material and 29 feet in hard material; thence to 27- and 28-foot depths, respectively, in the river to the upper end of the National Tube Co. dock, and to 20 feet over a width of 750 feet in the upstream turning basin. The Lake Carriers' Association recommended, in addition, moving the east breakwater 600 feet lakeward and lengthening it at both ends; swinging the west breakwater to the west and extending it lakeward; removing 1,500 feet of the east pier; dredging the enlarged harbor area; replacing the New York, Chicago & St. Louis Railroad bridge to provide a horizontal clearance of at least 225 feet; and easing the river bend near the bridge. Local interests have indicated their willingness and ability to cooperate in the provision of desired improvements.

5. *Recommended improvement.*—The recommended improvement provides for modification of the existing project for Lorain Harbor, Ohio, to provide for construction of an easterly breakwater 2,200 feet long and a westerly breakwater 400 feet long, both placed lakeward of the existing ones and separated to provide a clear opening 800 feet wide; removal of the outer 300 feet of the existing west breakwater and construction of a suitable pierhead at the lakeward end, giving a clear entrance 600 feet wide; construction of a shoreward extension of the east breakwater, with a circulation gap between the existing structure and the extension; removal of the outer 1,100 feet of the east pier; dredging to a depth of 29 feet in soft material and 30 feet in hard material from deep water to the modified opening in the present breakwater system with suitable flaring at the outer end; thence to depths of 28 and 29 feet, respectively, over widths of 800 to 250 feet to a point in the channel 2,200 feet above the west pier light; thence to depths of 27 feet and 28 feet, respectively, to a point 500 feet below the upstream limit of the existing project, with a new turning basin at the upper end 21 and 22 feet deep and 1,100 feet wide; and to a depth of 25 feet in soft and 26 feet in hard material in the westerly part of the outer harbor and lakeward of a line running parallel to and 50 feet from the end of the Baltimore & Ohio Railroad coal dock,

thence westward normal to the outer project limit; and Federal participation in the cost of replacing the New York, Chicago & St. Louis Railroad bridge with a vertical lift bridge providing a horizontal clearance of 205 feet and a vertical clearance of 100 feet; all generally in accordance with the plan of the district engineer and with such modifications thereof as in the discretion of the Chief of Engineers may be advisable; at an estimated cost to the United States of $19,323,000 for construction, and $50,900 annually for maintenance in addition to that now required; provided that local interests agree to: (*a*) furnish without cost to the United States all lands, easements, and rights-of-way necessary for construction and subsequent maintenance, when and as required; (*b*) hold and save the United States free from damages due to the construction and maintenance of the improvement; (*c*) when and where necessary, provide and maintain depths between the new channel limits and terminal facilities commensurate with related project depths; (*d*) make all necessary changes in docks and bulkheads, except for any required in connection with the railroad bridge replacement; (*e*) where necessary, construct terminal facilities to serve the prospective commerce of new industries; and (*f*) accomplish alterations as required in sewer, water supply, power and communication lines, and other utility facilities, except those included in the railroad bridge alteration. It is further recommended that the Chief of Engineers be authorized to enter into agreements with the owner of the New York, Chicago & St. Louis Railroad bridge for its replacement with a movable structure consistent with the recommended plan of improvement, the United States to participate in the actual construction costs of the replacement as contemplated in the principles set forth in section 6 of Public Law 647, 76th Congress; and that nothing in the preceding recommendations is to be construed as depriving the Federal Government of any powers it has for compelling alteration or removal of unreasonable obstructions to navigation.

6. *First costs.*—The estimated first costs of the recommended improvement, based on prices and conditions existing in 1958, are as follows:

Federal:	
Construction	$19, 323, 000
Navigation aids	235, 000
Preauthorization studies	52, 000
Subtotal	(19, 610, 000)
Non-Federal	[1] 2, 455, 000
Total	22, 065, 000

[1] Mainly for dock and bulkhead modifications, transmission line relocation, and dredging.

7. *Annual costs and benefits.*—Annual costs and benefits for the recommended improvement, computed on the basis of an economic life of 50 years and interest rates of 2.5 and 4.0 percent for public and nonpublic investments, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$725, 500	$113, 400	$838, 900
Maintenance	[1] 42, 400		42, 400
Total	767, 900	113, 400	881, 300
Average annual benefits:			
Savings in transportation of iron ore and stone			1, 078, 600
Reduction of vessel and dock damage and delays			148, 100
Total			1, 226, 700
Ratio of benefits to costs			1. 4

[1] Estimate based on increase of $50,900 in present cost of maintenance dredging and reduction of $8,500 in present cost of maintaining navigation aids.

8. The improvements proposed would permit the prospective fleet of bulk carriers to use this harbor when they are loaded to drafts permitted by the Great Lakes connecting channels. In Senate Document No. 71, 84th Congress, the system of harbors and connecting channels was estimated to have a benefit-cost ratio of 1.78. Current studies indicate that the system ratio will be greater

than estimated at that time. Final determination of the benefit-cost ratio for the system must await completion of the other harbor studies now in progress. However, it is clear from the present report that improvement of Lorain Harbor as proposed is economically justified, and it would contribute to the value of the system of which it is an integral part.

9. Alternative analysis on the basis of an economic life of 100 years would be conjectural and has not been made. It is unlikely that such analysis would provide a basis for selection of facilities different than those recommended. Provision of the recommended improvement would not preclude further modification of the Lorain Harbor project should the need arise.

10. *Apportionment of costs.*—The recommended local cooperation and apportionment of costs are in accordance with longstanding Federal policy for commercial navigation projects.

Ashtabula Harbor, Ohio

(H. Doc. 148, 86th Cong.)

1. *Navigation problem.*—Existing project depths, with a maximum of 24 feet at the iron ore docks, are not adequate to permit full loading to 25.5-foot draft of bulk cargo vessels that will use the Great Lakes connecting channels and the St. Lawrence Seaway. Local interests desire 27-foot depths in the outer harbor and in the lower main river channel; dredging as authorized of the upper 1,550 feet of the river; straightening of the river; an east entrance; extension to West 24th Street; and a high level bridge to replace the West Fifth Street lift bridge.

2. *Solutions considered.*—Detailed consideration was given in this interim report only to depths required to accomodate ore vessels loaded to the maximum safe draft of 25.5 feet. Deepening of the upper 1,550 feet of river is now authorized and needs no further study. Other desired improvements (straightening, east entrance, etc.) will be considered in the final comprehensive Great Lakes harbor study.

3. *Proposed plan of improvement.*—The proposed plan of improvement provides for modification of the existing project for Ashtabula Harbor, Ohio, to provide for a depth of 29 feet in soft and 30 feet in hard material in the entrance channel to a point just inside the outer ends of the breakwaters; thence 28 feet in soft and 29 feet in hard material in a channel to the inner breakwater; thence 27 feet in soft and 28 feet in hard material in a channel extending to the New York Central Railroad Co.'s slip and extending 2,000 feet up the Ashtabula River; 22 feet in soft and 23 feet in hard material in the turning area; and 28 feet in soft and 29 feet in hard material in areas adjacent to the 250-foot section of the inner breakwater when that section is removed as now authorized. Estimated first and annual costs and annual benefits, based on February 1958 price levels, a 50-year project life and 2½ percent Federal and 4 percent private interest rates, are as follows:

Item	Federal	Non-Federal	Total
1st costs	[1] $4,095,500	$980,000	[1] $5,075,500
Annual costs:			
Interest	[2] 106,200	39,200	
Amortization	[2] 43,600	6,400	
Increased maintenance	13,000	2,000	
Total annual costs	162,800	47,600	210,400
Annual benefits (iron ore)			877,900
Benefit-cost ratio			[3] 4.2

[1] Includes $18,500 for preauthorization studies.
[2] Based on Federal construction period of 3 years.
[3] Prior to allocation of benefits to connecting channels.

Analysis on the basis of a 100-year life and 2½ percent Federal and 4 percent private interest rates, would increase the benefit-cost ratio slightly but would not affect the evident justification of the proposed improvements.

4. *Apportionment of costs.*—The costs assigned to local interests are for dredging outside of project limits to accommodate vessels berthing at the docks. The report requires that local interests agree to:

(*a*) Hold and save the United States free from damages due to the construction and maintenance of the improvement; and

(*b*) Provide and maintain, without cost to the United States, access channels and berthing areas adjacent to piers and docks to depths commensurate with the depth of the Federal project.

5. *Discussion.*—The proposed modification of Ashtabula Harbor to accommodate iron ore vessels drawing 25.5 feet when fully loaded is economically justified, and will contribute materially to the value of the system of Great Lakes Harbors and connecting channels of which it is an integral part.

Erie Harbor, Pa.

(H. Doc. 199, 86th Cong.)

1. *Recommended project.*—The recommended project provides for modification of the existing project for Erie Harbor to provide for a depth of 29 feet in the entrance channel to a point opposite the inner end of the north pier; thence 28 feet in soft and 29 feet in hard material in the remainder of the entrance channel, within the general limits of the 25-foot basin and inner channel opposite the ore dock except as modified to eliminate from the project a triangular area along the easterly side; and a depth of 28 feet over a 300-foot westward extension of the 25-foot basin. These works will provide channels and a basin with depths equivalent to those being provided in the Great Lakes connecting channels. They will permit deeper loading of vessels using the harbor particularly vessels loaded with iron ore and stone.

2. *First cost.*—The estimated Federal first cost of the recommended project, based on prices and conditions existing in July 1958, is $1,743,000.[1] Non-Federal interests have done dockside dredging previously, to depths comparable to those recommended for the Federal project, and therefore no additional work by these interests is required at this time. The cost of this non-Federal work is not known.

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent for Federal expenditures, are:

	Federal
Average annual costs:	
Capital costs	$63,000
Additional maintenance	25,000
Total	88,000
Average annual benefits: Transportation savings resulting from deeper vessel loading	111,000
Ratio of benefits to costs	1.3

4. *Apportionment of costs.*—In view of the general nature of the benefits to be realized from the overall improvement, all costs for dredging the channels and basin will be borne by the United States.

5. *Local cooperation.*—Local interests are required to hold and save the United States free from damages due to construction and maintenance of the improvement; and maintain, without cost to the United States, depths in berthing areas adjacent to the iron ore dock commensurate with the depths provided in the related project area. Local interests have indicated willingness to provide the necessary items of local cooperation.

6. *Discussion.*—The recommended plan of improvement provides for the immediate needs of existing and prospective iron ore and limestone commerce at the present facilities at Erie Harbor. It is also considered to provide for the needs of navigation anticipated for the progressive development of the harbor. The improvements will permit more efficient movement of commerce by permitting deeper vessel loading. The effect of evaluation of the feasibility of the recommended plan of improvement using an amortization period substantially in excess of 50 years would be conjectural because of the difficulty in projecting long-range traffic patterns and trends in vessel development. Any effect is not considered to be sufficient to result in a change in the scope of the project or the basis for cost-sharing. The recommended improvements will not preclude future enlargement or extension of the project should the need arise.

[1] Includes $13,000 preauthorization studies and $1,000 for navigation aids.

7. A second interim report is being prepared to consider improvements westerly of the section currently recommended in order to meet the needs of overseas general cargo traffic.

BUFFALO HARBOR, N.Y.

(H. Doc. 151, 86th Cong.)

1. *Navigation problem.*—Existing project depths are not adequate to permit vessels calling at the southerly portion of the outer harbor at Buffalo to load to the maximum safe draft of 25.5 feet permitted by the Great Lakes connecting channels and the St. Lawrence Seaway. Local interests desire deepening to 27 feet in the south entrance and in the south portion of the outer harbor. Some interests desire a 27-foot depth in the entire harbor.

2. *Solutions considered.*—The only plan of improvement considered in this report is intended to provide reasonably safe and convenient accommodations for the largest lake vessels loaded with iron ore, limestone, or grain using the south outer harbor. Other desired improvements will be considered in the final consolidated report on Great Lakes harbors.

3. *Plan of improvement.*—The recommended plan of improvement would modify the existing project for Buffalo Harbor, N.Y., to provide for a depth of 30 feet for a width of 1,000 feet in the shoal area on the approach to the south entrance channel; 30 feet in the outer area and 29 feet in the inner area of the south entrance channel; and 28 feet in the southerly part of the outer harbor, south of a line perpendicular to and 2,000 feet north of the southerly end of the south breakwater. Non-Federal work required consists of deepening berthing areas in slips and alongside bulkheads shoreward of Federal project limits.

Estimated first and annual costs and annual benefits, based on November 1957 price levels, on a 50-year project life and 2½ percent Federal and 4 percent non-Federal interest rates, are as follows:

Item	Federal	Non-Federal	Total
First costs	[1] $2,379,000	$1,248,000	[1] $3,627,000
Annual costs:			
Interest	61,000	50,000	111,000
Amortization	25,000	8,200	33,200
Increased maintenance	[2] 15,000	21,000	36,000
Total annual costs (round figures)	101,000	79,000	180,000
Annual benefits:			
Iron ore			538,200
Limestone			161,400
Grain			25,100
Total annual benefits (round figures)			725,000
Benefit-cost ratio			[3] 4.0

[1] Includes $18,500 for preauthorization studies and $8,400 for aids to navigation.
[2] Includes $1,000 for maintenance of aids to navigation by Coast Guard.
[3] Prior to allocation of benefits to connecting channels.

Analysis on the basis of a 100-year life and 2½ percent Federal and 4 percent non-Federal (private) interest rates, would increase the benefit-cost ratio slightly, assuming no change in prospective average benefits after the first 50 years. The favorable conclusions in the report would not be affected.

4. *Apportionment of costs.*—The only costs assigned to local interests are the costs of dredging private berthing areas shoreward of Federal project limits. The report requires that local interests agree to:

(*a*) Hold and save the United States free from damages due to the construction and maintenance of the improvements; and

(*b*) Provide and maintain, without cost to the United States, depths at docksides, and access thereto, commensurate with depths provided in the related project area.

5. *Discussion.*—The proposed modification of the Buffalo Harbor project is economically justified. It is an integral part of the system of Great Lakes harbors and connecting channels and would contribute materially to the value of the system.

KAHULUI HARBOR, ISLAND OF MAUI, HAWAII

(H. Doc. 109, 86th Cong.)

1. *Navigation problem.*—Kahului Harbor, on the northern shore of the island of Maui, is the only deepwater port on the island. There is insufficient space in the existing turning basin to permit reasonably safe navigation, considering the prevailing wind and adverse sea conditions. Numerous marine accidents have occurred and expanding commerce and use of larger vessels are expected to add to the seriousness of this problem. Local interests desire enlargement of the turning basin.

2. *Recommended improvement.*—The recommended improvement provides for dredging an area on the west side of the harbor about 2,400 feet long and 600 feet wide to a depth of 35 feet.

3. *First cost.*—The estimated first cost of the recommended improvement, based on prices and conditions existing in 1958, is as follows:

Federal	[1] $964,800
Non-Federal	205,500
Total	1,170,300

[1] Includes $18,300 for preauthorization studies and $2,000 for navigation aids. The net Federal cost for construction is $944,500.

4. *Annual costs and benefits.*—Average annual costs and benefits for the recommended improvement, computed on the basis of a 50-year economic life and interest rate of 2.5 percent are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$34,000	$7,200	$41,200
Maintenance	5,000	1,000	6,000
Total	39,000	8,200	47,200
Average annual benefits:			
Navigation benefits			$126,900
Land enhancement			8,300
Total			135,200
Ratio of benefits to costs			2.9

Analysis on the basis of an economic life longer than 50 years would not provide a basis for selection of facilities alternative to those recommended.

5. *Apportionment of costs.*—Apportionment of the costs of the recommended improvement is in accordance with normal practice for commercial navigation projects. The estimated local first cost includes $175,300 for construction of a dike and revetment for retention of dredged material and a cash contribution of $30,200 in recognition of the land enhancement which would result from placement of the project spoil. Maintenance of the dike and revetment also would be a local responsibility.

6. *Discussion.*—Enlargement of the existing turning basin in Kahului Harbor is the only practicable means of alleviating the present unsatisfactory navigation conditions. The work recommended will effectively serve present and prospective commerce by substantially reducing delays in vessel arrival and departure under inclement weather conditions, reducing maneuvering time, preventing groundings, and substantially reducing marine accidents.

SOUTH KINGSTON AND WESTERLY, R.I., BEACH EROSION CONTROL

(H. Doc. 30, 86th Cong.)

1. *Beach erosion problem.*—Local interests desire restoration and protection of the State's shore property at Matunuck Beach (South Kingston) and the proposed town acquisition at Misquamicut Beach (Westerly), Rhode Island. Both beaches have been eroding, and Misquamicut Beach was breached during the 1954 hurricane. Approximately 9,841 square feet of beach is being lost yearly at Matunuck Beach and about 11,125 square feet at Misquamicut. Local interests also desire to develop the beaches for recreational use.

2. *Considered solutions.*—The only practicable plans of improvement are considered to require placement of suitable sandfill, supplemented by sand fences at both locations and by groins at Matunuck Beach.

3. *Proposed plan of improvement.*—The report recommends the following improvements:

(*a*) *Matunuck Beach.*—Widening approximately 3,830 feet of beach generally to a 150-foot width by direct placement of suitable sandfill, construction of 8 groins each about 260 feet long, and installation of sand fences, the construction of groins to be deferred pending demonstration of need except for the most easterly groin and that near the middle of the shore frontage;

(*b*) *Misquamicut Beach.*—Widening approximately 3,250 feet of beach generally to a 150-foot width by direct placement of suitable sandfill, and installation of sand fences.

Estimated first costs of the project works, annual costs, and annual benefits, based on October 1957 price levels, 50-year project lives, and a 2½-percent interest rate, are as follows:

Locality	Estimated 1st costs	Estimated annual charges	Estimated anual benefits	Benefit-cost ratio
Matunuck Beach: Beach fill, 8 groins, sand fences	$283,000	$54,000	$75,000	1.4
Misquamicut Beach: Beach fill, sand fences	138,000	18,200	88,200	4.8

NOTE.—The estimated annual charges for Misquamicut include $6,000 for periodic nourishment.

4. *Apportionment of costs and local cooperation.*—The estimated costs are apportioned in the report in accordance with Public Law 826, 84th Congress, which provides for Federal participation to the extent of one-third of the construction costs (including periodic beach nourishment for a limited period) for protecting publicly owned or publicly used property. The estimated Federal shares are $94,300 at Matunuck Beach, and $46,000 of the first costs and $2,000 annually for 10 years for periodic nourishment at Misquamicut Beach. Federal participation is recommended subject to the conditions that the State of Rhode Island or other responsible local authority:

(*a*) Obtain approval by the Chief of Engineers, prior to commencement of work on either project, of detailed plans and specifications for that project, and also the arrangements for prosecuting the work;

(*b*) Provide appurtenant facilities to the extent that anticipated recreational benefits will be realized;

(*c*) Provide at their own expense all necessary lands, easements, and rights of-way, including acquisition by a public agency of the shore at Misquamicut Beach involved in the recommended project; and

(*d*) Furnish assurances satisfactory to the Secretary of the Army that they will:

(1) Control water pollution to the extent necessary to safeguard the health of bathers;

(2) Maintain the protective measures during their economic life including periodic nourishment of Misquamicut Beach, as may be required to serve their intended purpose; and

(3) Maintain continued public ownership of the shores and their administration for public use during the economic life of the projects.

5. *Discussion.*—Analysis on the basis of 100-year life and 2½-percent interest rate would increase the benefit-cost ratios slightly, assuming no increase in the costs of maintenance for the longer period. The projects for both beaches appear economically justified by the anticipated benefits. The proposed Federal participation and local cooperation is in accordance with Public Law 826, 84th Congress.

KEY WEST, FLA., BEACH EROSION CONTROL STUDY

(H. Doc. No. 413, 85th Cong.)

1. *Beach erosion problem.*—The problem area consists of 6,200 feet of publicly owned shore on the south side of Key West, fronting on the Straits of Florida. A fine natural beach is understood to have existed in the area about 30 years ago, but had disappeared by 1944. Very little littoral material reaches the area. Local interests desire restoration of the beach, of such dimensions as to protect

South Roosevelt Boulevard, the seawall which defines the shoreline, and shoreward property, and to provide recreation.

2. *Solutions considered.*—The only practicable method of providing the desired protection and a suitable recreational beach is by artificial placement of a sand beach of suitable width, which would also require periodic replenishment, with material distributed as during initial restoration.

3. *Plan of improvement.*—The proposed plan of improvement would provide a 2-foot thick blanket of sand on a rockfill along the problem frontage. Estimated first costs, annual costs, and annual benefits, based on fall 1957 prices, a 50-year project life, and 2½-percent interest rate are:

First costs	$693,600
Anuual costs:	
Interest and amortization	24,460
Periodic beach nourishment:	
To replace alongshore losses	35,300
To replace offshore losses	16,600
Total annual	76,360
Annual benefits	198,000
Benefit-cost ratio	2.6

4. *Apportionment of costs and local cooperation.*—Since the entire frontage is publicly owned, cost-sharing proposed in the report is based on Public Law 826, 84th Congress, which permits the Federal Government to assume only one-third of the costs of construction and a part of the periodic beach nourishment costs for a limited period. The report apportions $263,200 in first costs and $11,800 beach nourishment costs annually for a period of 10 years to the Federal Government, with the remainder to be borne locally. In addition, local interests would be required to:

(*a*) Obtain approval by the Chief of Engineers, prior to commencement of work on the project, of detailed plans and specifications and arrangements for prosecution of the work on the project;

(*b*) Provide at their own expense all necessary lands, easements, and rights-of-way; and

(*c*) Furnish assurances satisfactory to the Secretary of the Army that they will—

(1) Maintain the protective measures during their economic life as may be required to serve their intended purpose, including periodic nourishment of the protective beach at suitable intervals;

(2) Control water pollution to the extent necessary to safeguard the health of bathers; and

(3) Maintain continued public ownership of the publicly owned shore upon which the recommended Federal participation is based and its administration for public use during the economic life of the project.

5. *Discussion.*—The proposed plan is the only practicable method of restoring the beach in the problem area at Key West. It is considered economically justified by prospective damage prevention, recreational, and increased property utilization benefits. Evaluation on a 100-year basis would probably increase the benefit-cost ratio slightly.

PROJECTS IN TITLE II

Blackstone River Basin, Lower Woonsocket, R.I.

(S. Doc. 87, 85th Cong.)

1. *Recommended project.*—The recommended project provides for construction, in the city of Woonsocket, R.I., on Blackstone, Mill, and Peters Rivers, of approximately 9,500 linear feet of levees and floodwalls, 4,700 linear feet of channel improvements, 2,300 linear feet of underground pressure conduits, 2 pumping stations, and removal of 2 existing dams on Blackstone River. These works will provide flood protection in the area downstream from the existing Woonsocket local flood protection project scheduled for completion in 1959.

2. *First cost.*—The estimated first cost of the recommended project, based on prices and conditions existing in 1956, is as follows:

Federal	$2, 970, 000
Non-Federal	1, 285, 000
Total	4, 255, 000

The cost of water rights at Bernon Dam, a local responsibility, have not been included in the project estimate but will not appreciably affect the economics of the project.

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Capital costs	$107, 000	$48, 400	$155, 400
Maintenance, operation and replacement		12, 400	12, 400
Total	107, 000	60, 800	167, 800
Average annual benefits:			
Prevention of flood damage			140, 000
Land enhancement			95, 000
Total			235, 000
Ratio of benefits to costs			1.4

Analysis on the basis of an economic life of 100 years and an interest rate of 2.5 percent probably would give a benefit-cost ratio slightly higher than the 1.4 value reported above.

4. *Apportionment of costs.*—Project costs are apportioned between the Federal Government and local interests in accordance with the Flood Control Act of 1936, as amended. The local share of project first costs includes a cash contribution of 16.1 percent of the cost of the work to be accomplished by the Federal Government, presently estimated at $570,000, in recognition of the land-enhancement benefits to be provided.

5. *Discussion.*—Flood protection for the lower Woonsocket area is urgently needed. Four major floods have occurred in the last 30 years including that of August 1955 which caused damages amounting to $12,300,000 in lower Woonsocket. The recommended flood protection plan was selected after consideration of channel improvement, reservoirs on the tributary Mill and Peters Rivers, dikes and floodwalls, and various combinations of measures. General channel improvement on the Blackstone River and a reservoir on the tributary Mill River would be marginally justified if provided alone, but would not be economically justified in combination with dikes and floodwalls necessary to afford an adequate degree of protection. A reservoir on the Peters River would effect only negligible reductions in flood stages at Woonsocket and other downstream damage points. From the standpoint of costs, degree of flood protection provided, and evaluated benefits, the recommended project comprises the best suited plan for protection of the lower Woonsocket area. City officials and local groups have concurred in the selected plan and favor its early construction. Alternative analysis on the basis of a 100-year economic life would modify the relative economic merit of the various measures considered somewhat, but would not influence selection of the combination of measures necessary to provide positive flood protection and, thus, would not provide grounds for modification of the scope of the recommended plan.

Quinebaug River, Thames River Basin, Conn. and Mass.

(S. Doc. 41, 86th Cong.)

1. *Recommended project.*—The recommended project provides for construction of the West Thompson Reservoir on the Quinebaug River, at a site about 2 miles upstream from Putnam, Conn. This work will provide additional protection to the communities downstream.

2. *First cost.*—The estimated first cost of the recommended project, based on prices and conditions existing in 1957, is as follows:

Federal	$4,010,000
Non-Federal	0
Total	4,010,000

3. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Interest and amortization	$144,200		$144,200
Maintenance, operation and replacement	22,000		22,000
Loss of taxes		$10,000	10,000
Total	166,200	10,000	176,200
Average annual benefits: Prevention of flood damages			229,000
Ratio of benefits to costs			1.3

Analysis on the basis of an economic life of 100 years and an interest rate of 2.5 percent probably would give a benefit-cost ratio slightly higher than the 1.3 value reported above.

4. *Apportionment of costs.*—All the cost of construction of the project has been assigned to the Federal Government as the benefits are general in nature and accrue to the many downstream areas. This assignment of cost is in accordance with the Flood Control Act of 1936, as amended.

5. *Discussion.*—Flood protection for the Quinebaug River subbasin is urgently needed. Many industrial and commercial establishments and residential developments are located in the flood plain. Six major floods have occurred in the last 30 years, causing widespread damage and disruption of the basin economy. With construction and operation of the four authorized reservoirs, a recurrence of the August 1955 flood would still produce losses of $18,700,000 in the Quinebaug River subbasin. The recommended flood-control reservoir at West Thompson was selected after consideration of reservoirs to supplement the four presently authorized, dikes, and floodwalls, channel improvements, and various combinations of these methods. A reservoir at the Red Bridge site, an alternate to West Thompson, was found economically justified but the cost is much higher. The construction of a local protection project at Putnam, Conn., is also economically justified but the benefits are not sufficient to justify both the reservoir and local protection works. From the standpoint of costs, degree of flood protection provided, and evaluated benefits, the recommended project comprises the best suited plan for flood protection in the Quinebaug River Basin. The State of Connecticut concurred in the selected plan and favors its early construction. Alternative analysis on the basis of a 100-year economic life would modify the relative economic merit of the various measures considered somewhat, but would not influence selection of the recommended project.

Richland, Chambers, and Cedar Creeks, Tex. (Waxahachie Creek Watershed)

(H. Doc. 424, 85th Cong.)

1. *Recommended improvement.*—The recommended improvement comprises modification of the comprehensive plan for improvement of the Trinity River and tributaries, Texas, to provide for construction of Bardwell Reservoir at mile 6, Waxahachie Creek, generally in accordance with the plan of the district engineer presented in House Document No. 424, 85th Congress, 2d session, and with such modification thereof as in the discretion of the Chief of Engineers may be advisable. Bardwell Reservoir will serve the purposes of flood control and water conservation. Project features are as follows:

Dam:
Location: Mile 6, Waxahachie Creek.
Type: Concrete and earthfill.
Length: 7,184 feet.
Height: 83 feet.
Spillway: Gated.

Reservoir:

Storage allocations:	*Acre feet*
Siltation	8,700
Water conservation	29,500
Flood control	79,600
Total	117,800

Elevations and areas:	*Elevation, feet mean sea level*	*Area acres*
Top siltation pool	404.0	1,190
Spillway crest	411.0	1,910
Top water conservation pool	419.0	2,770
Top gates	439.0	5,400
Maximum water surface	442.9	6,050
Top of dam	448.0	-----

2. *Project costs.*—Estimated costs for the recommended improvement, based on prices and conditions prevailing in the fourth quarter of 1955, are as follows:

1st cost	[1] $6,992,000
Average annual cost of operation, maintenance, and replacements	[1] 40,000

[1] Costs are rounded to nearest $1,000.

3. *Benefit-cost ratios.*—Average annual costs and benefits, and benefit-costs ratios, for the recommended improvement, based on economic lives of 50 and 100 years and an interest rate of 2.5 percent, are as follows:

Item	Amount	
	Based on economic life of 50 years as reported in H.Doc. 424, 85th Cong.	Based on economic life of 100 years
Average annual costs:		
Investment costs	$250,300	$195,200
Maintenance, operation, and replacement	40,200	40,400
Total	290,500	235,600
Average annual benefits:		
Flood damage prevention	236,750	236,750
Water conservation	82,000	82,000
Total	318,750	318,750
Ratio of benefits to costs	1.10	1.35

4. *Intangible project effects.*—Bardwell Reservoir will be located in an area characterized by frequent periods of excess rainfall causing major floods, and periods of protracted drought causing serious surface water shortages, particularly for municipal purposes. Reservoir operations will modify this unfavorable natural regimen by conserving excess flows for later, beneficial use. Substantial improvement in the general economic welfare of the service area of the project may be expected as the result of these operations. This improvement is not fully reflected in the evaluated project benefits which are based on expected reductions in physical flood damage and the cost of providing conservation storage by alternative construction.

5. *Current and future needs.*—The flood control capacity required in Bardwell Reservoir was determined by analysis of major storms during the 1907–50 period in both their natural and transposed positions. The selected capacity is sufficient to control the floods of record at the damsite. In determining the conservation storage capacity which should be provided cognizance was taken of the requests of local interests and of the probable water requirements of the local area. Yield versus storage relationships were established, and cost estimates were developed for several volumes of conservation storage. These studies disclosed that 29,500 acre-feet of conservation storage could be provided at reasonable cost and that this volume was generally in accordance with the desires of the cities within the watershed. Dependable yield could be obtained from larger volumes of conservation storage but unit storage costs would be substantially higher for the larger volumes. The storage allocations adopted will serve both current and reasonably prospective flood control and conservation needs. Appropriate adjustments in storage allocations can be made during the planning stage should the need for this arise. The Federal Power Commission has concluded that production of power at the project site would not be economically feasible. The reservoir will afford opportunities for attractive recreational development.

6. *Allocation of costs.*—The results of allocation of the costs of the recommended improvement by the use of facilities method as reported in House Document No. 424, 85th Congress, and by alternative methods listed in Senate Resolution 148, are as follows, based on assumed economic lives of 50 and 100 years:

Item	Method of cost allocation Allocations are in $1000 units			
	Use of facilities	Separable cost-remaining benefits	Priority of use	Incremental cost
Economic life of 50 years:				
Allocation to flood control:				
First cost	5,104.0	4,964.0	5,384.0	5,384.0
Percent	(73)	(71)	(77)	(77)
Annual cost of maintenance, operation, and replacements	29.0	33.9	38.0	38.0
Percent	(73)	(84)	(94)	(94)
Allocation to water conservation:				
First cost	1,888.0	2,028.0	1,608.0	1,608.0
Percent	(27)	(29)	(23)	(23)
Annual cost of maintenance, operation, and replacements	11.0	6.3	2.2	2.2
Percent	(27)	(16)	(6)	(6)
Economic life of 100 years:				
Allocation to flood control:				
First cost	5,104.0	4,685.0	5,384.0	5,384.0
Percent	(73)	(67)	(77)	(77)
Annual cost of maintenance, operation, and replacements	29.5	31.3	38.2	38.2
Percent	(73)	(78)	(95)	(95)
Allocation to water conservation:				
First cost	1,888.0	2,307.0	1,608.0	1,608.0
Percent	(27)	(33)	(23)	(23)
Annual cost of maintenance, operation, and replacements	10.9	9.1	2.2	2.2
Percent	(27)	(22)	(5)	(5)

Costs allocated to water conservation are a local responsibility. The full local cooperation requirements for the recommended improvement provide that prior to construction local interests give assurances satisfactory to the Secretary of the Army that they will obtain all the necessary water rights and contribute the part of the total first cost of the project and the annual cost of operation, maintenance, and replacements allocated to water conservation, presently estimated at 27 percent, which amounts to $1,888,000 and $11,000, respectively; with the further proviso that local interests be permitted to contribute their share of the construction cost (*a*) in a lump sum prior to initiation of construction, (*b*) in annual amounts during the period of construction, proportional to the annual Federal appropriations for construction, or (*c*) in equal annual payments, including interest during construction and interest on the unpaid balance, within the economic life of the project but in no event to exceed 50 years from the date on which the project is first available for storage of water for any purpose; and that local interests be permitted to contribute their share of the annual cost of

operation, maintenance, and replacements (*a*) on an annual basis as these costs are incurred or (*b*) in one lump sum on a present-worth basis.

7. *Extent of interest in project.*—Local interests desire flood control and water conservation measures in the Waxahachie Creek basin. In commenting upon the Chief of Engineers' proposed report on the recommended improvement the Governor of Texas, by letter of January 23, 1958, advised that the Bardwell Reservoir project was approved as to feasibility subject to providing no more than 29,500 acre-feet of conservation storage.

8. *Repayment arrangements.*—Repayment arrangements for the recommended improvement are described in the statement of local cooperation requirements in paragraph 6, above.

9. *Alternative project considerations.*—Preliminary studies showed that a reservoir at the Bardwell site on Waxahachie Creek would serve an important role in the comprehensive system for flood control in the Trinity River basin as a whole, and at the same time would be conveniently situated for water supply purposes for Ennis and possibly other communities in this region. A reservoir at the Bardwell site also would be compatible with the soil conservation program for the Waxahachie Creek basin which contemplates construction of 21 small reservoirs. Detailed consideration was not given to other sites. Alternative considerations were limited primarily to selection of project features and storage allocations. The basis for selection of storage allocations is discussed in paragraph 5, above.

Blieders Creek, New Braunfels, Tex.

(H. Doc. 180, 86th Cong.)

1. *Flood problems.*—Flood damages are confined almost entirely to the city of New Braunfels. Above the city the flood plain is devoted almost entirely to grazing, however, in the city an expensive residential area, thermoelectric powerplant, industrial warehouses, railroad property, city water plant, and the park facilities at Comal Springs are subject to flood damage.

2. *Recommended plan of improvement.*—The plan of improvement recommended consists of a single-purpose reservoir for flood control to be located on Blieders Creek about 1.5 miles north of New Braunfels. The reservoir would have a gross capacity of 7,700 acre-feet, formed by an earthfill dam, about 84 feet high and 3,130 feet long, with an uncontrolled outlet structure on Blieders Creek and an ungated natural saddle spillway discharging to the Guadalupe River. The proposed project would be of local-protection type. Accordingly, local interests would be required to comply with all requirements of local cooperation normally set forth for such projects. These requirements are (*a*) provide without cost to the United States all lands, easements and rights-of-way necessary for construction and operation of the project, (*b*) hold and save the United States free from damages due to the construction and operation, (*c*) maintain and operate the project at their own expense in accordance with rules and regulations prescribed by the Secretary of the Army, and (*d*) bear the expense of all required relocations.

3. *Project costs and economic analysis.*—The total first cost of the project, exclusive of the cost of preauthorization studies, is estimated at $1,143,000 on the basis of third quarter 1957 prices, of which $1,060,000 is for construction and $83,000 is for lands and relocations. The estimated annual cost shown in the basic report is $45,900, consisting of $41,900 for interest and amortization computed on the basis of 2.5 percent interest and a 50-year economic life, and $4,000 for annual operation and maintenance.

4. *Benefits and benefit-cost ratios.*—The benefits credited to the project are all flood control benefits consisting of damages prevented. These benefits amount to an estimated $108,900 annually. The benefit-cost ratio on the basis of a 50-year economic life is 2.4 to 1, as shown in the basic report. Precise analysis on the basis of an economic life of 100 years has not been made. The probable net effect of a lower amortization rate, higher average maintenance and operation costs, and some loss of flood control storage capacity by sedimentation over the longer period would be a slight increase in the benefit-cost ratio given above.

5. *Physical feasibility and provision for future needs.*—The recommended project will provide a high level of flood control at New Braunfels throughout its life. The intermittent nature of the runoff in Blieders Creek is not conducive to development of the reservoir site for hydroelectric power, irrigation, recreation, or fish and wildlife conservation, and provisions for such purposes are not included in the plan. Preliminary consideration was given to water supply needs during the report studies but local interests did not express a definite desire for inclusion of water supply storage at that time, and provision for such storage is not included

in the project plan. In view of the later expression of interest in water conservation discussed in the following paragraph, further consideration will be given to this matter during preconstruction planning in accordance with the Water Supply Act of 1958.

6. *Extent of interest in project.*—Local agencies and interested groups have expressed approval of the proposed plan of improvement, and no objections are known to exist. The City Commission of New Braunfels and the commissioners court of Comal County have indicated that they will meet the requirement of local cooperation. The Governor of the State of Texas approved of the plan and concurred in the recommendation of the Texas State Board of Water Engineers that plans provide for later conversion from a flood control project to a combined flood control-water conservation project. Consideration will be given during the advance planning stage to including water supply storage in accordance with the provisions of the Water Supply Act of 1958.

7. *Alternative projects.*—Consideration was given to possible alternative projects in studies for the basic report. The best alternative plan (plan C) consists of a 180-foot-bottom diversion channel from mile 4.0 on Blieders Creek through German Creek (north of New Braunfels to the Guadalupe River) with some sections of levee adjacent to the channel. Another plan (plan B) consists of two detention reservoirs located on tributaries above the recommended reservoir in combination with a 100-foot-bottom channel and levees along the same alinement as plan B.

	Plan A (recommended)	Plan B	Plan C
Construction cost	$1,143,000	$2,521,200	$1,374,100
Annual charges	$45,900	$98,900	$51,600
Annual benefits	$108,900	$103,900	$98,900
Benefit-cost ratio	2.4–1	1.05–1	1.9–1

Analysis on the basis of an economic life of 100 years would not substantially change the relative economic merit of the recommended and alternative plans.

8. On the basis of the study of alternatives described briefly in the foregoing paragraph it was determined that the recommended plan of improvement was the most practicable plan of flood control on Blieders Creek for the city of New Braunfels.

Connoquenessing Creek, Pa.

(H. Doc. 110, 86th Cong.)

1. *Flood problem.*—This report is concerned primarily with correction of the flood problem at Butler, Pa., by improvement of the channel of Connoquenessing Creek or other means.

2. Connoquenessing Creek rises in Butler County, Pa., flows in a southwesterly direction and enters Beaver River near Ellwood City. Its principal tributaries above the city of Butler, at mile 44, are Stony Run, Thorn Creek, Bonnie Brook, Coal Run, and Sullivan Run. The drainage area of Connoquenessing Creek above Butler is about 88 square miles. The creek course which meanders through Butler is inadequate to carry flood flows because of fills and other obstructions. The channel has a capacity of about 2,100 cubic feet per second and Sullivan Run which enters the creek in the western part of the city has a capacity of 500 cubic feet per second. There is no Corps of Engineers project for flood protection at Butler. The Works Progress Administration did some channel work in 1938 and 1939. The Department of Forests and Waters of the Commonwealth of Pennsylvania has recently awarded a contract for limited work as a temporary remedial measure. Butler, with a population of 23,482 in 1950, is the largest city in Butler County. Lyndora, adjoining the city on the southwest, has a population of about 4,800. The urban areas contain extensive heavy industries, railroads, highways, and numerous commercial and residential developments.

3. Floods of major proportions may occur at Butler at any time during the year but the most severe have resulted from summer-type storms. Reports indicate that floods in 1861, 1903, and 1906 are comparable to the highest flood of recent record. Observations of flood heights at Butler since 1923 include 18 floods which exceeded elevation 989.5. The maximum flood of record, which occurred on October 16, 1954, reached an elevation of 994.1 at the mouth of Sullivan Run and a discharge of 4,900 cubic feet per second. Extensive damage occurs when a flow

of 2,600 cubic feet per second, equivalent to elevation 989.5, is exceeded. The estimated damage to properties, primarily industrial, commercial, and residential, on the 300 acres which would be inundated by recurrence of October 1954 flood stages, is $1,735,500, based on April 1958 development and values. The estimated average annual flood damage under the same conditions is $235,000.

4. Local interests desire local flood protection either by major channel improvements along Connoquenessing Creek, including a cutoff across the neck of the west-end loop in the creek, or by reservoirs on tributary streams. They state that they are willing to comply with the requirements of local cooperation.

5. *Improvements considered.*—Consideration was given to flood protection along Connoquenessing Creek by channel improvement; dikes or floodwalls, diversion, reservoirs, or combinations of such measures.

(*a*) *Reservoirs:* Because of the topography and flood producing characteristics of the drainage basin above Butler a high degree of reservoir control would be necessary to provide significant reduction of flood damages. In view of the topography and economic development of the valleys reservoir development would be very costly. Reservoirs considered either along, or in combination with other measures, would not return benefits commensurate with their costs.

(*b*) *Diversion:* Complete solution of the flood problem at Butler by means of diversion of floodflows would not be practicable. Limited possibilities for diversion exist, however, and have been combined with channel improvement in the recommended improvement.

(*c*) *Dikes or floodwalls:* Protection by means of dikes or floodwalls would be physically feasible at Butler but would be impracticable from the standpoint of economics and operating convenience.

(*d*) *Channel improvement:* Channel improvement combined with cutoff of a loop of Connoquenessing Creek comprises the only means of providing a significant degree of flood control in the Butler area at a cost commensurate with the benefits to be realized.

6. *Recommended project.*—The recommended project provided for improvement of Connoquenessing Creek at Butler, Pa., to provide for channel enlargement and protection with an appurtenant cutoff, from slightly above the mouth of Sawmill Run to a point about 360 feet above the South Monroe Street Bridge, a distance via the cutoff of approximately 4 miles. Local interests will be required to: (*a*) provide without cost to the United States, all lands, easements, rights-of-way, and suitable spoil-disposal areas necessary for construction of the project; (*b*) bear the expense of all necessary railroad, utility, and sewer alterations required for the project; (*c*) establish and enforce project channel limits to prevent encroachments on the channel improvements; (*d*) hold and save the United States free from damages due to the construction works; and (*e*) maintain and operate each usable element of the work after completion of that element and of all works after completion thereof in accordance with regulations prescribed by the Secretary of the Army.

7. *First cost.*—The estimated first cost of the recommended project, based on conditions and prices prevailing in 1958, is as follows:

Federal	[1] $1, 558, 700
Non-Federal	440, 800
Total	1, 999, 500

[1] Exclusive of $60,900 for preauthorization studies.

8. *Annual costs and benefits.*—Average annual costs and benefits for the recommended project, computed on the basis of an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual charges:			
Capital costs	$58, 500	$15, 900	$74, 400
Maintenance		5, 700	5, 700
Total	58, 500	21, 600	80, 100
Average annual benefits: Prevention of flood damages			235, 000
Ratio of benefits to costs			2.9

Economic analysis on the basis of an economic life of 100 years would not significantly affect the relative economic merit of the recommended plan and other measures such as reservoirs, and would have no bearing on the impracticability of measures such as dikes and floodwalls.

9. *Allocation of costs.*—The costs of the recommended project are allocated between the Federal Government and local interests in accordance with normal procedures for local flood protection projects, responsive to policies established in flood control legislation.

10. *Discussion.*—The recommended project comprises a logical and economically justified means of providing flood protection at Butler, Pa. Alternative means either would be more costly or impracticable.

Big Sandy River and Tug and Levisa Forks, Ky., W. Va., and Va.

(H. Doc. 184, 86th Cong.)

I. RECOMMENDED PROJECT

1. *Recommended project.*—The recommended project comprises a flood control dam and reservoir on the North Fork of Pound River, Wise County, Va. The dam, of rockfill type, would be located immediately upstream from Pound, Va., 1.0 mile above the mouth of North Fork. The reservoir would have a total storage capacity of 11,300 acre-feet, of which 1,900 acre-feet would be for silt storage and recreational use and 9,400 acre-feet would be for flood control.

2. *Project costs and benefits.*—

(*a*) First cost: The first cost of the North Fork project, all Federal, is estimated at $3,681,000, based on prices prevailing in March 1957 for similar work (exclusive of $8,000 already incurred for preauthorization studies).

(*b*) Average annual cost: The estimated average annual cost of the North Fork project, all Federal, based on an economic life of 50 years and an interest rate of 2.5 percent, is as follows:

Interest and amortization	$134,900
Operation and maintenance	20,100
Total	155,000

(*c*) Average annual benefits: Average annual flood control benefits creditable to the North Fork project, when operating in conjunction with authorized Pound and Fishtrap Reservoirs and existing Ohio Basin reservoirs, would amount to $245,000.

(*d*) Benefit-cost ratio: The benefit-cost ratio for the recommended project is 1.58. Alternative analysis on the basis of an economic life of 100 years would increase this figure to about 1.92.

3. *Intangible project effects.*—The protection of property from flood damage has been considered as a tangible benefit and so evaluated. The North Fork project would have no appreciable pollution abatement, soil or forest resources benefits. Preliminary studies by the U.S. Fish and Wildlife Service indicated that there would be some losses to upland forms of wildlife by pool encroachment, and that the pools would not contribute appreciably to the fishery of the stream. The permanent pool of 138 acres should be beneficial for recreational purposes since the project would be in an area lacking in lakes or large bodies of water. Although there is no known loss of life by floods at Pound, Va., the flood characteristics are such that loss of life could occur during large floods. The project would reduce the potential hazard at Pound and would operate with other reservoirs in the Ohio River Basin to prevent loss of life in the Ohio River Valley. The economy of the area to be protected by the reservoir is founded principally on coal mining and coal transportation. The system of reservoirs of which the North Fork would be a part would serve to alleviate flooding in portions of Pound River, Russell Fork, Levisa Fork, and Big Sandy River. Reduction of the floods by the system would enhance the economy of the protected areas.

4. *Physical feasibility and cost of providing for future needs.*—Studies of the North Fork project recognized the possibility that demands for municipal and/or industrial water supply might develop during the useful life of the project. In fact, local interests originally requested that the reservoir be constructed for flood control, water supply, and recreation. When contacted relative to cooperation

NOTE.—The service life of mechanical parts (gates, etc.) was estimated at 35 years in computing annual charges.

officials of the town of Pound indicated that although water supply was desirable, they were not financially able to participate or obligate the town for water supply. The project as recommended for flood control could be modified after construction to include some water supply storage if desired. Estimates of cost for such a modification were not prepared, but would not be unreasonably high.

5. *Allocation of costs.*—All project costs are for flood control and would be borne by the Federal Government.

6. *Extent of interest in project.*—Local interests desire reservoirs for general flood protection of Tug and Levisa Fork Valleys, with consideration being given to related reservoir uses. The officials of Pound, Va., have endorsed the North Fork project by resoltuion of the town council.

7. *Effect of project on State and local governments.*—The North Fork project would have no known significant effect on the State government. Tax revenues of local govenments would be reduced somewhat by reason of taking of lands for reservoir purposes. It is probable, however, that these losses would be compensated as a result of recreational activities in the area surrounding the reservoir. The cost of local governmental services should not be significantly affected.

II. OTHER PROJECTS CONSIDERED

8. Local flood protection measures were considered at seven localities with the results indicated below:

Locality	Type of improvement	Thousands of dollars			Benefit-cost ratio
		First cost	Average annual cost	Average annual benefits	
Grundy, Va.	Channel paving	2,670	110.0	73.4	0.67
Paintsville, Ky.	Levees and walls	5,576	210.8	55.3	.26
Pound, Va.	Channel paving	4,030			.9
Do.	Tunnel and channel	3,600			(1)
Haysi, Va.	No plan feasible				
Matewan, W.Va.	Levee and walls	1,560	60.0	33.5	.6
Pond Creek near Goody, Ky.	Levee and pumps	3,500	130.0		.3
Pikeville, Ky.	Levees and walls	5,700	221.0	267.0	1.21

[1] Less than unity.

Description of the above measures is contained in House Document 184, 86th Congress. Project economics were computed on the basis of tangible flood control benefits and an economic life of 50 years. The physical life of the measures considered would be about the same as the economic life used in the computation. Intangible project effects would not be sufficient to offset the unfavorable benefit-cost ratios determined for all of the localities except Pikeville. The authorized reservoir system would provide a high degree of flood protection at Pikeville and the Levisa Fork generally. Local protection would not be justified in addition to reservoir control. Accordingly, local protection measures at Pikeville were not recommended.

9. *Reservoirs.*—Valley developments along Levisa Fork downstream from the mouth of Russell Fork; on Russell Fork below Haysi, Va.; on McClure River and Shelby Creek; on Beaver Creek and its two main forks; and on the main stem and most of the major tributaries of Tug Fork; prohibit construction of economically justified reservoirs at these sites. The steep streams, generally narrow valleys, and improvements in the valleys of most of the small tributaries preclude development of an economical system of small reservoirs. Reservoirs are not justified at this time on Panther Creek, W. Va., or on Big Creek, Ky., upper and lower tributaries, respectively, of Tug Fork. Reservoirs at Paintsville on Paint Creek, Ky., and at Yatesville on Blaine Creek, Ky., would provide storage at a reasonable cost but they are so located that their flood control effects along the Big Sandy River are small. An effective plan for flood relief would consist of reservoirs at the Pound, Fishtrap, and Haysi sites, and on the North Fork of the Pound River. These are economically justified when considered as a system. When considered on an incremental basis, only the Pound, Fishtrap, and North Fork Reservoirs are economically justified at this time. Although all the various reservoirs, except Fishtrap, were studied for multipurpose development, including power at the Pound-Towers sites, improvements for water supply, hydroelectric

power, low-flow regulation, and recreation are not justified. The Pound and Fishtrap Reservoirs are eligible for selection under authority of the 1938 Flood Control Act as units in the comprehensive plan for flood control in the Ohio River Basin. North Fork Reservoir is recommended in this report, as described in section I, above. Results of reservoir studies for flood control are summarized in the following tabulation:

Reservoir and reservoir system	Estimated cost	Benefit-cost ratio	
		Reservoirs acting as a system	As last addition to system
3-reservoir systems for flood control:			
Pound	$16,052,000	1.69	1.24.
Fishtrap	37,067,000	1.18	1.58.
Haysi	18,128,000	1.23	0.82.
System total	71,247,000	1.31	
Pound	16,052,000	1.76	Above unity.
Fishtrap	37,067,000	1.22	Do.
Haysi alternative	12,246,000	1.27	Below unity.
System total	65,365,000	1.37	
Pound	16,052,000	1.93	Above unity.
Fishtrap	37,067,000	1.38	Do.
North Fork	3,681,000	1.58	1.1.
System total	56,800,000	1.54	
4-reservoir systems for flood control:			
Pound	16,052,000		
Fishtrap	37,067,000	1.62	None justified as last addition to 4-reservoir system.
Haysi	18,128,000	1.18	
North Fork	3,681,000	1.23	
		1.48	
System total	74,928,000	1.30	
Pound	16,052,000	1.66	
Fishtrap	37,067,000	1.22	Do.
Haysi alternative	12,246,000	1.27	
North Fork	3,681,000	1.50	
System total	69,046,000	1.35	
Additional reservoirs for flood control:			
Paintsville	8,292,000		0.72.[1]
Yatesville	11,528,000		1.01.[1]

[1] As addition to Ohio Basin system without authorized Pound, Fishtrap, or Haysi projects and recommended North Fork project in operation. Flood control effects in Big Sandy Basin would be small.

Cayuga Inlet, Ithaca, N.Y.

(H. Doc. 204, 86th Cong.)

1. *Problem considered.*—This report is concerned primarily with prevention of flood damage resulting from overflow of Cayuga Inlet at Itahca, N.Y. Some flood damage occurs very year on developed areas along the inlet, and major flooding has occurred at least 10 times since 1900. Repetition of the maximum flood of record (July 1935) under present conditions would inundate 740 acres containing 640 residential units, 149 commercial units, and other developments, and would cause damages in excess of $1.5 million. Average annual damages in the area which would be protected by the recommended project are estimated at about $220,000 under present conditions.

2. *Recommended improvement.*—The recommended improvement provides for reduction of flood damages along Cayuga Inlet in Ithaca, N.Y., by means of enlarged and additional channels and a diversion levee system. Three new railroad bridges and two new highway bridges would be required in connection with the plan.

3. *First costs.*—The estimated costs of the recommended improvement, based on the cost of similar work in central and western New York, and prices prevailing in September 1958, are as follows:

First cost:	
Federal	[1] $3, 950, 000
Non-Federal	[2] 1, 838, 000
Total	5, 788, 000
Annual cost of maintenance and operation (non-Federal)	30, 000

[1] Exclusive of $33,000 for preauthorization studies already incurred
[2] Including cash contribution of $85,000.

4. *Benefit-cost ratios.*—Average annual costs and benefits and the benefit-cost ratio for the recommended improvement, based on an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Interest and amortization	$145, 700	$67, 200	$212, 900
Surveys and inspections	300		300
Maintenance and operation		30, 000	30, 000
Total	146, 000	97, 200	243, 200
Average annual benefits:			
Prevention of damage to existing facilities			212, 200
Prevention of damage to future facilities			[1] 49, 400
Land enhancement			20, 700
Total			282, 300
Ratio of benefits to costs			1. 2

[1] Based on development expected without provision of flood control measures.

Precise anlysis on the basis of an economic life of 100 years has not been made. It is probable that such analysis would result in a slight increase in the benefit-cost ratio given above.

5. *Intangible project effects.*—The recommended improvement will eliminate need for evacuation of families under difficult conditions, and inconvenience caused by delays and detours resulting from flooding of highways. These beneficial project effects have not been evaluated in monetary terms.

6. *Current and future needs.*—The recommended improvement will provide a high degree of flood protection to present and anticipated developments in the Cayuga Inlet area.

7. *Local cooperation.*—The measures proposed are for flood control only. Prior to initiation of construction local interests will be required to give assurances satisfactory to the Secretary of the Army that they will (*a*) contribute in cash or equivalent work an amount equal to 2.1 percent of the first cost for construction, the contribution presently estimated at $85,000, and, if in cash, to be made either in a lump sum prior to commencement of work, or in installments prior to commencement of pertinent work items, in accordance with work schedules as required by the Chief of Engineers, the final apportionment of cost to be made after actual costs have been determined; (*b*) furnish without cost to the United States all lands easements, and rights-of-way necessary for construction of the project; (*c*) hold and save the United States free from damages due to the construction works; (*d*) maintain and operate all the works after completion, including that part of the existing channel and walls extending from the foot of Taber Street to mile 1, in accordance with regulations prescribed by the Secretary of the Army; (*e*) construct a highway bridge across the new channel at State Street and reconstruct the Clinton Street Bridge; (*f*) make all necessary changes in buildings, utilities, streets, and highway bridge approaches; and (*g*) prescribe and enforce regulations to prevent encroachment on channels and rights-of-way necessary for proper functio ing of the project, including the existing channel from the foot of Taber Street to mile 1. These requirements are in accordance with usual practice for projects of this type. The cash contribution required is in recognition of the land enhancement benefits which would be provided.

8. *Extent of interest in project.*—Local interests desire protection of properties located along Cayuga Inlet. The New York State Flood Control Commission has expressed willingness to furnish the required assurances of local cooperation.

9. *Repayment arrangements.*—Repayment arrangements for the recommended improvement are described in the statement of local cooperation requirements in paragraph 7, above.

10. *Alternative project considerations.*—In devising the plan for flood protection in the Cayuga Inlet area consideration was given to reservoirs, levees and floodwalls, channel rectification and enlargement, diversion of floodflows, flood plain zoning and evacuation, and combinations of these measures. On the basis of the present and anticipated development of the area, related flood protection needs, and project costs and benefits, the recommended channel and levee plan was found to comprise the most logical means of providing flood protection.

SMOKES CREEK, N.Y.

(H. Doc. 200, 86th Cong.)

1. *Problem considered.*—This report is concerned with prevention of flood damage resulting from overflow of Smokes Creek and its branches at Lackawanna, N.Y. Major flooding has occurred five times since 1953. Average annual damages in the area which would be protected by the recommended project are estimated at about $117,000 under present conditions.

2. *Recommended improvement.*—The recommended improvement provides for reduction of flood damages along Smokes Creek in Lackawanna, N.Y., by means of enlarged and deepened channels, with protection of banks and bridge foundations.

3. *First costs.*—The estimated costs of the recommended improvement, based on the cost of similar work in western New York, and prices prevailing in January 1958, are as follows:

1st cost:	
Federal	[1] $2,041,000
Non-Federal	[2] [3] 638,000
Total	[3] 2,679,000
Annual cost of maintenance: Non-Federal	5,000

[1] Includes $67,000 for preauthorization studies, already incurred.
[2] Including cash contribution of $28,000.
[3] Exclusive of $509,000 for additional work, to be performed by local interests, necessary because the length of channel to be improved has been increased by those interests.

4. *Benefit-cost ratio.*—Average annual costs and benefits, and the benefit-cost ratio for the recommended improvement, based on an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

	Federal	Non-Federal	Total
Average annual costs:			
Interest and amortization	$74,600	$23,300	$97,900
Surveys and inspections	200		200
Maintenance		5,000	5,000
Total	74,800	28,300	103,100
Average annual benefits:			
Prevention of damage to existing facilities			111,400
Prevention of damage to future facilities			[1] 11,000
Land enhancement			5,200
Total			127,600
Ratio of benefits to costs			1.2

[1] Based on development expected without provision of flood control measures.

It is considered that, even when properly maintained, a channel improvement project of this type would require major reconstruction after approximately 50 years. It would not be realistic to make an analysis on the basis of an economic life of over 50 years.

5. *Intangible project effects.*—The recommended improvement will eliminate the need for evacuation of families under difficult conditions and inconvenience caused by delays and detours resulting from flooding of highways. These beneficial project effects have not been evaluated in monetary terms.

6. *Current and future needs.*—The recommended improvement will provide a high degree of flood protection to present and anticipated developments in the Smokes Creek area.

7. *Local cooperation.*—The measures proposed are for flood control only. Prior to initiation of construction, local interests will be required to give assurances satisfactory to the Secretary of the Army that they will: (*a*) contribute in cash or equivalent work 1.4 percent of the first cost for construction, with such contribution, presently estimated at $28,000, if in cash, to be paid in a lump sum prior to commencement of work, the final allocation of cost to be made after actual costs have been determined; (*b*) provide without cost to the United States all lands, easements, and rights-of-way necessary for construction of the project; (*c*) hold and save the United States free from damage due to the construction works; (*d*) maintain and operate all the works after completion in accordance with regulations prescribed by the Secretary of the Army; (*e*) raise highway bridges across the South Branch at Wood Street and Johnson Avenue to provide vertical clearances satisfactory to the Chief of Engineers, and make all necessary changes in buildings, utilities, streets, and highway bridge approaches; (*f*) prescribe and enforce regulations to prevent encroachment on channels and rights-of-way necessary for proper functioning of the project; and (*g*) construct and maintain, in accordance with plans satisfactory to the Chief of Engineers, all the project works west of a point 3,840 feet downstream from Hamburg Turnpike, including channel enlargement and 2 jetties, both jetties to be extended as the lake shoreline may be changed; provided, however, the construction of the jetties may be postponed until, in the opinion of the Chief of Engineers, the work becomes necessary. The cash contribution required is in recognition of land-enhancement benefits which would be provided. This and the other requirements of local cooperation, except for that pertaining to work west of a point 3,840 feet downstream from Hamburg Turnpike, are in accordance with normal practice for local flood protection. The latter work applies to an artificial channel through land created by local interests by placing fill, and is considered a local responsibility.

8. *Extent of interest in project.*—Local interests desire protection of properties located along Smokes Creek. The New York State Flood Control Commission has expressed willingness to furnish the required assurances of local cooperation.

9. *Repayment arrangements.*—Repayment arrangements for the recommended improvement are described in the statement of local cooperation requirements in paragraph 7, above.

10. *Alternative project considerations.*—In devising the plan for flood protection in the Smokes Creek area, consideration was given to reservoirs, diversion channels, levees, and combinations of these measures, as well as to the recommended plan. On the basis of the present and anticipated development of the area, related flood protection needs, and project costs and benefits, the recommended channel improvement plan was found to be the most logical means of providing flood protection.

MOJAVE RIVER, CALIF.

(H. Doc. 164, 86th Cong.)

1. *Project description.*—The recommended plan of improvement provides for a single-purpose flood control reservoir on the West Fork of the Mojave River about 2,000 feet upstream from its junction with Deep Creek. Project features are as follows:

Dam:
Type: Concrete gravity.
Length: 443 feet.
Height: 138 feet.
Spillway: Ungated.
Outlet works: Gated.
Dike-type: Earth embankment.

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Reservoir:		
Storage allocations:		*Acre-feet*
Flood control		30, 180
Sediment		10, 000
Total		40, 180
Elevations and areas:	*Elevation, feet mean sea level*	*Area acres*
Spillway crest	3, 106. 0	1, 057
Maximum water surface	3, 122. 3	1, 460
Top of dam	3, 126. 7	-----

2. *Project costs.*—Estimated costs for the recommended improvement, based on prices and conditions prevailing in March 1956, are as follows:

1st cost	$3, 070, 000
Average annual cost of operation, and maintenance	18, 700

3. *Benefit-cost ratios.*—Average annual costs and benefits, and the benefit-cost ratio for the recommended improvement, based on an economic life of 50 years and an interest rate of 2.5 percent, are as follows:

Average annual costs:	
Investment	$111, 000
Operation and maintenance	18, 700
Total	129, 700
Average annual benefits: Flood damage prevention	241, 000
Ratio of benefits to costs	1. 86

Precise analysis on the basis of an economic life of 100 years has not been made. The probable net effect of a lower amortization rate, higher average maintenance accrue from operation of the recommended improvement would be those noncalculable benefits resulting from the prevention of interruption to traffic on the double track transcontinental railroad used jointly by the Union Pacific Railroad and Atchison, Topeka, & Santa Fe Railway Cos. Also, appreciable but intangible benefits would result from the increase in replenishment of the underground basins because of increased infiltration as a result of prolonging the river discharges over the sand and gravel parts of its bed. Danger of loss of life in the low residential areas of Barstow and Victorville would be reduced.

5. *Physical feasibility and provision for future needs.*—The recommended plan is feasible from the standpoint of engineering and economics. The average reduction in damages from all floods would be approximately 65 percent. Essentially all damages from a flood of 20,000 cubic feet per second would be prevented. Water conservation for domestic, industrial, military, and agricultural purposes is of importance in this area. However, in connection with improvements for flood control, studies indicate that it would not be feasible to develop a multiple-purpose project including water conservation and hydroelectric power. Conservation of water by means of storage is infeasible because of the insufficient average seasonal runoff to meet the potential demands of all lands legally entitled to the water; the prohibitively high cost of a distribution system; the difficulty in establishing firm water rights; the high evaporation loss during periods of storage. Because the annual runoff fluctuates greatly, it is not feasible to provide sufficient storage for hydroelectric power. The topographical, geological, and hydrological characteristics of the basin are the primary causes of the high peak discharges and erosion rates. The establishment of the storage criteria for sediment is based on information available from observed floods. With an average annual sediment inflow allowance of 1 percent of the mean annual discharge of 22,000 acre-feet, the estimated 50-year sediment allowance is approximately 10,000 acre-feet.

6. *Extent of interest in project.*—Local interests desire flood control improvements and improvements for conservation of water, if feasible. The recommended project appears to be satisfactory to local interests and they have indicated their willingness to cooperate to the extent required. They have agreed to improve and maintain the Mojave River channel between the reservoir and Afton to accommodate flows up to 20,000 cubic feet per second.

7. *Alternative project considerations.*—The control of floods by various types of reservoirs, channel improvements, and by combinations of both reservoirs and channel improvements was considered. Because multiple-purpose reservoirs, including water conservation, would not be practical, and because inclusion of

power features in the reservoir would be infeasible, no multiple-purpose reservoirs were considered in detail. Large expenditures for channel improvements are not justified. The cost of providing a channel adequate for the control of medium to large floods would be prohibitive, principally because of the length of improvements required. Further studies were limited principally to consideration of various sizes of reservoirs at several sites to maintain or reduce flows to the capacity of the Mojave River channel. The cost of a dam at the Upper Narrows site just above Victorville would considerably exceed the benefits and since local interests have strongly objected to this site, this project was not studied in detail. The estimated cost of a dam on the main stream immediately below the mouth of the West Fork, called the Forks site, is $12 million. Based on an economic life of 50 years and an interest rate of 2.5 percent, the annual charges would be $470,000, the annual benefits $365,000, and the benefit-cost ratio 0.78. The alternative plan, therefore, is not economically justified. Analysis on the basis of an economic life of 100 years would not substantially change the relative economic merit of the recommended and alternative plans.

Walnut Creek, Calif.

(H. Doc. 76, 86th Cong.)

1. *Flood problem.*—Floods on Walnut Creek occur principally as the result of winter rainfall. About 6,100 acres in the flood plain at and below the city of Walnut Creek are subject to flood damage. Of this area, about 2,900 acres lie within the urban and suburban areas of Walnut Creek, Concord, and Pacheco. Land use is gradually evolving from agricultural to suburban, since the area is within commuting distance of the San Francisco Bay area. The 1955 flood caused damages estimated at $1,467,000. Average annual future damages, allowing for prospective development without flood control, are estimated at $1,187,000. Local interests desire flood control by means of channel improvements and bank stabilization.

2. *Considered solutions.*—Consideration was given to reservoir storage, channel enlargement, levee construction, and various combinations thereof. Zoning is not considered acceptable in the area. Alternative plans considered variations in details, such as channel sizes, levee design, and number and location of drop structures.

3. *Plan of improvement.*—The most feasible plan of improvement for Walnut Creek and the lower reaches of its principal tributaries consists of channel rectification and enlargement and levee construction. The improvement is designed to supplement the existing upstream project of the U.S. Soil Conservation Service, and also incorporate the concrete conduits through the city of Walnut Creek constructed or planned by local interests. The plan provides for 14.1 miles of channel four reinforced concrete drop structures, one stilling basin, 11.8 miles of levees, and 4 pumping stations. Estimated first and annual costs and annual benefits, based on July 1957 prices, a 50-year project life, and 2½-percent interest rate, are as follows:

[All amounts in thousands of dollars]

Item	Federal	Non-Federal	Total
1st costs:			
Construction (Corps of Engineers)	[1] $19,420	0	[1] $19,420
Lands, damages, roads, utilities	0	$4,940	4,940
Cash contribution (see par. 4)	−1,440	1,440	
Total net first costs	[1] 17,980	6,380	[1] 24,360
Annual costs:			
Interest	450	160	610
Amortization	185	65	250
Maintenance, operation and replacements	0	125	125
Total annual costs	635	350	985
Annual benefits:			
Flood damage prevention			1,027
Land enhancement			255
Total annual benefits			1,282
Benefit-cost ratio			1.3

[1] Excluding $40,000 for preauthorization surveys.

Analysis on the basis of an economic life of 100 years and an interest rate of 2½ percent would probably give a somewhat higher benefit-cost ratio, although the benefits of protecting the increased development assumed in later years might be offset somewhat by increased costs of maintenance, operation, and replacements.

4. *Apportionment of costs.*—The costs of the proposed local protection plan were apportioned between the Federal Government and local interests in accordance with the Flood Control Act of 1936 as amended. The local share of project first costs includes a cash contribution of 7.4 percent of the cost of the work to be accomplished by the Federal Government, presently estimated at $1,445,000, in recognition of the land-enhancement benefits expected. The remainder of the local first costs, presently estimated at $4,940,000, would be for lands, easements, rights-of-way, and relocations of roads, bridges, and utilities, except for railroad facilities. In addition, local interests would be required to maintain and operate the project, and make major replacements when needed, at an estimated average annual cost of $125,000; and hold and save the United States free from damages due to the construction works.

5. *Discussion.*—The proposed plan of improvement is considered the most feasible and is economically justified. The Board of Supervisors of Contra Costa County by resolution dated January 21, 1958, stated that it would furnish, or make arrangements to furnish, all the requirements of local cooperation.

Senator KERR. General, we want you to know that you are always welcome here and we will be glad now to hear your statement.

STATEMENT OF MAJ. GEN. EMERSON C. ITSCHNER, CHIEF OF ENGINEERS, DEPARTMENT OF DEFENSE

General ITSCHNER. Thank you very much, Mr. Chairman.

Mr. Chairman and members of the committee, it is a pleasure for me to again appear before you to discuss the activities of the Corps of Engineers in water resource development.

First, however, I should like to introduce members of my staff who will appear before you later.

First is Colonel Olmstead, Acting Assistant Chief of Engineers for Civil Works, taking the place of General Person temporarily; Colonel Smith, Assistant Chief of Civil Works for Eastern Divisions; Colonel Giesen, Assistant Chief of Civil Works for Midwestern Divisions; Lieutenant Colonel Vivian, Assistant Chief of Civil Works for Northwestern Divisions; Mr. McRae, Assistant Chief of Civil Works for the Lower Mississippi Valley Division; and Messrs. Anderson, Landenberger, and Van Vladricken, of the Project Development Branch, Office of Chief of Engineers; Mr. Weinkauff, Chief of that Branch; and Mr. Walker, of the Programing Branch of the Southwestern Division in Dallas, Tex.

Approximately a year has elapsed since enactment of the River and Harbor, Flood Control, and Water Supply Acts of 1958.

The events of this year have provided further evidence of the value of wise control, development, and utilization of our Nation's water resources, and of the need for careful planning to achieve this purpose.

During the past year 28 navigation improvements, 2 bridge alterations, 2 shore protection projects, 11 local flood protection projects, 4 flood control dams, and 1 multiple-purpose project—including power—were completed to the point of useful operation.

Flood losses of about $300 million were prevented by all projects during fiscal year 1958, the last year of complete record. Power generation exceeded 26.5 billion kilowatt-hours.

Senator KERR. General, do you have an estimate of the value of that power or revenue it can produce?

General ITSCHNER. I can get that information for you, sir. I do not have it here.

(The information referred to is as follows:)

In fiscal year 1959, power revenues reported by the Department of the Interior from the sale of power from Corps of Engineers projects, together with revenues from power sold by the corps at the St. Marys' River plant, amounted to about $70 million.

General ITSCHNER. Use of navigation facilities continued at a high rate. And recreational use of projects approached the 100 million visitor-days per year mark.

In total, some 23,000 miles of waterways have been improved for navigation, including about 10,000 miles of channels which provide depths over 9 feet for modern barge transportation. Traffic on these waterways (exclusive of Great Lakes traffic) has grown from 8 billion ton-miles in 1929 to 115 billion ton-miles. Some 500 harbors on the coasts have been improved.

In the flood control field, 151 flood control and multiple-purpose projects, and 300 local flood protection projects have been completed or placed in operation. These have prevented flood damages of over $9 billion to date—in the order of three times the cost of the flood control improvements.

Over 6 million kilowatts of generating capacity have been installed in 32 projects. A substantial beginning has been made in meeting long-range water supply needs. At 18 of the completed reservoirs capacity exceeding 1,200,000 acre-feet is under contract for municipal and industrial water supply.

Reservoir releases for irrigation totaled 1,600,000 acre-feet in 1958. The completed reservoirs also have provided a major recreational resource. At normal pool levels they have a total water surface area of about 3 million acres, or almost 4,700 square miles. In 1958 attendance amounted to 95 million visitor-days, more than double the figure for just 5 years ago. These are some of the highlights.

I am sure that the members of the committee are familiar with the magnitude of the completed civil works program. You have watched the total numbers of completed reservoirs and navigation projects grow over the years, and you are aware of the substantial benefits being returned. I think the totals are impressive. What is more striking, however, is the rate at which demand for project services and use of projects is increasing. The fourteenfold increase in ton-miles of traffic on improved waterways between 1929 and 1957, the tremendous growth in recreational use of reservoir areas, the increasing use of improved harbors for commercial and recreational traffic, and the rapidly growing demands for reservoir storage for water supply and low flow regulation are examples.

Senator KERR. General, on page 1 the last paragraph, you said in total some 23,000 miles of waterways have been improved for navigation. That is not total mileage via inland waterways, is it?

General ITSCHNER. Our total authorized mileage is in excess of that, sir—something in the neighborhood of 28,000 miles of navigable waterways.

Senator KERR. I thought there was even a little more than that. Would you put the figure on that into the record?

General ITSCHNER. Yes, sir.

(The tabulation referred to follows:)

Mileage of U.S. waterways authorized for improvement and improved by the Corps of Engineers

System or region	Authorized mileage, by depths, in feet				Improved mileage, by depths, in feet			
	Under 9	9 to 13.9	14 and over	Total	Under 9	9 to 13.9	14 and over	Total
Atlantic coast	3,079	2,428	1,099	6,606	2,936	2,268	1,035	6,239
Gulf coast	2,985	2,432	431	5,848	2,810	1,216	396	4,422
Pacific coast	1,248	262	467	1,977	1,171	270	584	2,025
Mississippi River system	5,877	7,193	344	13,414	3,042	6,451	273	9,766
Great Lakes	188	22	309	519	103	8	292	403
Subtotal	13,377	12,337	2,650	28,364	10,062	10,213	2,580	22,855
Duplicated mileage [1]			23	23			23	23
Total mileage, all waterways	13,377	12,337	2,627	28,341	10,062	10,213	2,557	22,832
In rounded figures				28,000				23,000

[1] In Gulf Intracoastal Waterway and Sabine-Neches Waterway.

Senator KERR. Proceed.

General ITSCHNER. Growing demand for water resource improvements and their use is the inevitable result of increasing population and improving standards of living.

In some areas we already are facing for the first time the fact that water is not an inexhaustible resource. The task before us is to determine the demands which must be met in the future and to plan wisely so that this may be done in an efficient manner.

Some idea of the magnitude of the problem may be obtained from nationwide projections assembled in connection with comprehensive studies of major river basins now in progress.

These envision an increase in population from more than 171 million today to 195 million in 1965, 248 million in 1980, and 370 million in year 2010. Similarly, the present numbers of households and people employed are expected to more than double in the next half century.

Gross national product is expected to increase at an even greater rate. These projections, made on a middle-ground basis, provide positive advance warning of great expansion in demands for water supply, flood control, power, low-flow regulation, navigation, outdoor recreational opportunities, and other water-related services. Any major failure in meeting these demands on schedule will result in in serious disruptions in our economic growth.

The answer is clear. We simply must adapt our water resource planning and development activities to the dynamic, long-range requirements of an expanding population and economy. This will require full recognition by all levels of government and all elements of our economy of the compelling importance of water resource development, and the full cooperation of all concerned in overcoming conflicts of interest and solving the problems of financial responsibility for this work.

The works we build today must be compatible with plans for satisfaction of future needs if ultimate optimum development of our water resources is not to be precluded.

This means that we must devise plans which will provide a guide to orderly, long-range development as well as select projects for immediate or early construction.

To the maximum practicable extent we recognize this requirement in our survey work. For example, in planning flood control measures consideration is given to the pattern of growth and development in the flood plain, the possibility of changed conditions resulting from redevelopment or zoning programs, and other factors which have bearing on determination of the long-range flood problems which would exist in the absence of improvement.

Navigation studies take into account such factors as trends in vessel size and loading, barge and towboat development, and related navigation improvement, so that project depth and alinement, lock sizes, and other physical factors may be chosen in full recognition of the most likely future conditions of use. As another example, power and water supply provisions are related to projections of load and demand. Studies of this kind seek to identify, insofar as practicable, the factors relevant to economic growth as a guide to formulation of projects and programs.

The importance of comprehensive development of specific units or elements of basinwide plans also is becoming increasingly evident.

We must strive to obtain the full advantages of multiple-purpose project development, including reduction in the cost of individual project services and effective utilization of limited project sites. The strong, well-established trends toward recreational use of reservoirs and inclusion of water supply storage are compelling examples of the need and possibilities for multiple-purpose use.

Senator CASE. General Itschner, your last sentence there, in which you refer to the trend toward recreational use of reservoirs and inclusion of water supply storage, you mention there two purposes which under my observations seem to have increasing importance in recent years, and were not present in our original thought about flood control in river and harbor projects, is that correct?

General ITSCHNER. Yes, Senator Case, I think that is quite correct. The original concept was that all of our projects should be either for navigation or flood control. But in recent years, the requirements for recreational use and water supply have increased manyfold. We have only to pass along the highways many miles from lakes or waterways of any type and we notice the great increase in the number of small recreational craft that are being sold along the highways. We also see boats carried on trailers in great numbers over the week-ends. We feel that both of these uses are becoming increasingly important and they are a very real and necessary part of the program that must be recognized.

Senator CASE. Has the corps attempted to make any dollar and cents evaluation of the public benefit or value of visitor-days?

General ITSCHNER. Yes, sir; we have, and we believe in our studies that the best way to attempt to evaluate the recreational benefit under existing procedures and laws is to go to the National Park Service or to the State agency concerned with recreation and determine from them, if possible, what is the value of recreation at a specific reservoir.

It will vary somewhat, depending upon the presence of other like facilities in that area. We have found that the general value that they give us varies between 50 cents and $1.50 per visitor-day.

We think that those values are quite conservative and those are the values that we use.

Senator CASE. Mr. Chairman, I recall that in consideration of some legislation a year or two ago you suggested that a dollar per day might be a figure that could be used in evaluating the benefits of a given project. Now General Itschner has just suggested that in going to agencies which have been in this field of public recreation, such as the National Park Service, he finds valuations ranging from 50 cents to $1.50. Thus I assume that your estimate, Mr. Chairman, of $1 a day at least is an average that is midway between these two figures.

Now applying that to the figure given earlier in General Itschner's statement, of an approach to 100 million——

Senator KERR. The actual figure is 95 million.

Senator CASE. Visitor-days, and that having doubled in the last 5 years gives a pretty sharp pinpointing of a trend.

General ITSCHNER. Yes, sir.

Senator CASE. As well as the valuation of the social benefits.

General ITSCHNER. Yes, sir. Last year the amount was 95 million visitor-days, and based upon the experience so far this year, we have every reason to suppose it will exceed 100 million visitor-days this year.

Senator CASE. If we could assume that the benefit of the recreational features of these projects would be $100 million in this year, then for the large part that offers a considerable augmentation of the benefits used in determining the benefit-cost ratios on these projects.

Senator KERR. Would the Senator yield?

Senator CASE. Yes.

Senator KERR. I recall with a great deal of satisfaction, the gratitude and pride in title 3 of the Flood Control Act of 1958, legislation sponsored by the Senator from South Dakota and the Senator from Oklahoma, having to do with including the economic value of storage space for municipal and industrial waterway projects.

It is my hope that the Senator from South Dakota and I may be able to put a title 3 into this omnibus bill, which would be a direction for the recognition of the economic value of recreation features. So I want you to know that I am listening with a great deal of gratification and satisfaction to what he is saying on this subject.

Senator CASE. Mr. Chairman, it always gives me pleasure to make an observation that affords the chairman an opportunity to pat us both on the back in the splendid manner in which he is able to do, and I want to come to that water supply storage feature, because that was the second phrase in the sentence to which I directed attention.

But before I go to that, I want to point out also that General Itschner at one point in his statement referred to the flood control projects and said—

> These have prevented flood damages of over $9 billion to date in the order of three time the cost of the flood control improvements.

There is a sentence in the statement, Mr. Chairman, in coming from the Chief of Engineers, that ought not to be overlooked in any review that may be made of his testimony today, and I have interrupted here in order to put a little emphasis on some of these significant statements that the Chief of Engineers is making. I would like to have the people of the country, the press and others who have sometimes referred to flood control projects as pork-barrel projects

or logrolling projects, to get the significance of a statement that the flood damages prevented to date would be capitalized at $9 billion which is in the order of 3 times the cost of the flood control improvements. When a flood strikes a section of the country and the newspapers are filled with headlines about the homes that are inundated and the families that are driven from their homes and the highways that are destroyed or the power projects that are thrown out of commission or the loss and suffering that is given, they don't talk about the pork-barrel projects. They talk about the damages that are threatened and they report those damages in millions of dollars.

It isn't quite as spectacular when you don't have the damage, but I do think a statement that the flood damage prevented in these projects to date are in the order of five times their cost is a statement that is worthy of attention and emphasis.

Now then, coming to this other phrase that was used in the sentence of the Chief, at which point I interrupted him, you referred to the inclusion of water supply storage as a compelling example of need and possibilities for multiple-purpose use.

It is true, as the chairman has suggested, that in the omnibus Rivers and Harbors Act last approved, we included a new title, title 3, on water supply. Time has not permitted too much use of the provision of that title, but I would like to invite the Chief of Engineers if he could at this time to give or to make some observation about the use and prospective use of the water supply title of the last omnibus bill.

I have in mind that we made a provision not merely for current water supply projects, but we authorized the engineers in their design of projects hereafter to include an accommodation of prospective water supply requirements.

So I would like the Chief if it meets your purposes, Mr. Chairman, to develop a little bit his expression with regard to water supply storage.

General ITSCHNER. Senator Case, title 3 to the last omnibus bill, which we call the Water Supply Act, provided, as you know, that local interests could obtain future storage space in reservoirs for water supply purposes for industry or domestic use without interest for a period of 10 years, and also they could repay the cost of that water supply over a period of 50 years.

Senator CASE. And that reimbursement for the capital costs should start when they start using the project?

General ITSCHNER. That's correct, sir, including the cost of interest on the capital investment. We feel that that provision was an extremely wise one which will provide for water supply in the future which will be so urgently needed as we look at the picture today. However, the time has been rather short since that act has been enacted, and our reports take a long time to process. Consequently, while we have had a great deal of interest in it, we have not yet been able to determine just what that interest will be in quantitative terms. Some of the projects that you will consider in this bill do have water supply included in them. But actually I don't think any of them have provision for future water supply under the terms of title 3 of the 1958 omnibus bill.

Senator CASE. Thank you very much. I just thought that several of the statements you were making have a considerable significance, and possibly by a little interruption it would provide some emphasis.

So that those who read these hearings or report them will give an opportunity to——

General ITSCHNER. If I may add just a word, sir, to what you have said about the value of flood control, I think it would interest the committee.

Omitting the Mississippi River flood control project, because that has been in existence so much longer than the rest, about 30 years now, and taking all of the other flood control projects in the Nation, the average length of time that those projects have been effective has been 10 years. Now these projects have produced flood control savings so far in those 10 years of $3 billion out of that total of $9 billion that I gave you, the other $6 billion being the Mississippi River project.

Therefore in just 10 years we have produced benefits of $3 billion from projects that cost $2.8 billion.

Senator CASE. And of course the life of those projects is considerable?

General ITSCHNER. The life, Senator, is extremely great. It is much more than the 50 years that we use in our studies leading to an economic determination as to the justification of the project. I don't think we can quite multiply the benefits by 5 because we are considering a theoretical 50-year life as compared with 10 years of experience, because we do have to take into account the inflation factor. Nevertheless, the increase is great. It is at least 2.5 to 1.

Senator CASE. Just one more observation and I shall let you proceed with your statement. You referred at page 3 of your statement to the prospective increase in population. You said, "These envision an increase in population from more than 171 million today to 195 million in 1965," which is just about 5 years away, "248 million in 1980, 370 million in the year 2010." Have you made any estimate of the increase in demand that this increase in population will make so far as domestic water use is concerned?

General ITSCHNER. We have assembled such information. I do not have those figures here. The per capita increase will be quite great in addition to the population increase, so that the product of the two results in a very great requirement for water for domestic purposes in future years.

I might say that those figures which I have used are ones which were given to us by the Department of Commerce, and they are median figures, particularly derived for our studies and especially the Delaware River study.

Senator CASE. If my memory serves me correctly, one of your predecessors, General Sturgis, in making the review before this committee stated that as of the time he was making it our requirements for water for domestic and municipal use had increased since the turn of the century by fourfold, of which half was attributable to a doubling of the population, the other half attributable to the increased amount of water that we use in our modern way of life.

If that factor were to be applied to the figures that you supply here on population, it would certainly emphasize the importance of water storage, and it does give point I think to the action of the Senate a short time ago in creating the special or Select Committee on Water

Resources which is chairmaned by the distinguished Senator from Oklahoma, the chairman of this particular subcommittee. As time goes on I know that those of us who were privileged to serve on that select committee will be calling on you for additional data in this field.

General ITSCHNER. Senator Case, I believe that a large part of the increase is due to the much greater industrial use of water, although there is also an increase in domestic use, and I feel sure that that will continue to grow as time goes on and it will accelerate.

Senator CASE. I think I omitted the word "industrial." That should have been included with the domestic use. I think the fourfold increase did include the industrial.

Senator KERR. I do not think so. The fourfold increase that you referred to came about first by reason of the population more than doubling, and second by reason of the increase in the per capita consumption. I think that since 1900 that the per capita consumption of water for domestic purposes has more than doubled.

General ITSCHNER. I can't answer that, sir.

Senator CASE. Mr. Chairman, I suggest that we give the Chief of Engineers an opportunity to put those figures into the record at this point.

Senator KERR. I would like that.

Senator CASE. With some delineation as to the source of the increase.

General ITSCHNER. Yes, sir; I shall make a statement on that entire subject for insertion into the record if desired by the committee.

(The statement referred to follows:)

WATER SUPPLY

The fourfold increase in use of water to which reference is made applies to total use rather than per capita use. (See page 19 of record of hearings before a subcommittee of the Committee on Public Works of the U.S. Senate on S. 414, S. 524, S. 1069, and others, April 18, 19, 20, 21, 1955.) This increase is the combined result of about a twofold growth in population and about a twofold growth in per capita use of water for all purposes during the period 1900 to 1950.

The following figures, assembled by the U.S. Public Health Service from various studies and sources, provide information on experienced and prospective fresh water use.

TABLE A.—*Total fresh water use*

Year	Population (millions)	Total fresh water use	
		Billions of gallons per day	Gallons per capita per day
1900	76	41	540
1950	151	170	1,130
1955	165	221	1,340
1957	170	268	1,575
1975	220	[1] 453	2,060
1980	275	597	[2] 2,170

[1] From Business Service Bulletin 136, Business and Defense Service Administration, U.S. Department of Commerce, January 1956.

[2] From Industrial College of Armed Forces Thesis No. 143, by D. R. Woodward, Department of the Interior, April 1957.

TABLE B.—*Fresh water use for major purposes*

Year	Population, millions	Fresh water use for major purposes. (Upper figure in billions of gallons per day. Lower figure in parentheses in gallons per capita per day, based on total population.)				
		Municipal	Rural	Industrial (direct)	Irrigation	Total
1950 [1]	151	[2] 13.5 (90)	3.5 (25)	65.0 (430)	88.0 (585)	170.0 (1,130)
1955 [3]	165	[2] 17.0 (105)	2.4 (15)	91.2 (555)	110.0 (665)	220.6 (1,340)
1975 [4]	220	[2] 29.8 (130)	7.2 (35)	[5] 246.4 [5] (1,120)	169.7 (775)	453.1 (2,060)
1980 [6]	275	37.2 (135)		394.2 (1,435)	165.7 (600)	597.1 (2,170)

[1] From U.S. Geological Survey Circular 115, "Estimated Use of Water in the United States, 1950."
[2] Including industry served by municipal systems.
[3] From U.S. Geological Survey Circular 398, "Estimated Use of Water in the United States, 1955."
[4] From Business Service Bulletin 136, Business and Defense Service Administration, U.S. Department of Commerce, January 1956.
[5] Includes undetermined quantity of brackish water.
[6] From Industrial College of Armed Forces Thesis No. 143, by D. H. Woodward, Department of the Interior, April 1957.

Table A discloses that the fourfold increase in total water use experienced between 1900 and 1950 may be expected to be almost repeated during the shorter period from 1950 to 1980. The key factors again will be an approximate doubling of both population and per capita use of water. Table B indicates that direct use of water for industrial purposes will continue to become an increasingly important component of total water usage. Some adjustment of the prospective water use figures given in the tables for years 1975 and 1980 would be necessary to conform to the population estimates referred to by General Itschner, which envision a total population of 248 million in 1980. The changes would not be sufficient to modify the general pattern and magnitude of use indicated by the tables.

Senator KERR. I want to say that I was here at the turn of the century, and the domestic consumption in the average home was for drinking and cooking water. And you look at the domestic consumption of water now, it is by reason of many uses different and at times unrelated to either cooking or drinking.

I would like to ask a question or two there about the economic benefit of flood-control projects. What is the basis of the so-called cost-benefit ratio, General?

General ITSCHNER. A benefit-cost ratio, Mr. Chairman, is a ratio of the benefits which we anticipate a project will produce over a theoretical life of 50 years to the cost of the project at the time it is built plus the interest on that cost plus any maintenance, operation, and replacement charges.

Senator KERR. In other words, if you come here and say a project has a cost-benefit ratio of 1.2 to 1, that means that in your opinion that project, No. 1, will produce enough benefits to pay for it in 50 years plus its cost of operation plus the cost of repair, improvement and replacement plus interest?

General ITSCHNER. Yes, sir.

Senator KERR. So that at the end of 50 years it will have produced enough benefits to do all of those things, to pay for the cost of the project with an increment of 20 percent above the initial cost?

General ITSCHNER. That is correct, sir.

Senator KERR. All right. Now then, you tell us that flood-control projects costing 2 billion 8, aside from those on the Mississippi, have produced benefits in the field of prevention of damages by reason of floods alone of $3 billion?

General ITSCHNER. That is correct.

Senator KERR. In 10 years?

General ITSCHNER. Yes, in an average life of 10 years, yes, sir.

Senator KERR. Now what is the average in your judgment roughly of the cost-benefit ratio of all of those projects as disclosed by the recommendations and the statements of the Corps of Engineers to the Congress as a basis for the authorization of them when authorized?

General ITSCHNER. I compute that, sir, and the average benefit-cost ratio, weighted for the various costs of the projects, was 1.5 to 1.

Senator KERR. Which meant that in a period of 50 years it would pay itself out with a 50 percent additional increment, on the basis of the estimates that were used by the Congress when it contemplated an incremented authorization?

General ITSCHNER. That is correct, yes.

Senator KERR. But experience has proven it to be far more valuable than the estimates indicated they would be at the time of their authorization?

General ITSCHNER. That's correct, sir.

Senator KERR. Now was the $2.8 billion the cost of those projects attributable to the flood-control features, or was that figure what represented total cost?

General ITSCHNER. No, sir. The $2.8 billion figure I gave you was the cost of those projects assessed against flood-control features.

Senator KERR. Attributable to flood control?

General ITSCHNER. Yes, sir.

Senator KERR. So that actually instead of a project paying itself out on an average with a 50 percent additional value in a period of 50 years, experience on all of the projects in the United States, all the flood-control projects in the United States, exclusive of those on the main stem of the Mississippi, has been that they have more than paid themselves out in 10 years.

General ITSCHNER. That is correct, sir.

Senator KERR. Now you said that you didn't know whether the future prevention of damages would accelerate at an equal rate or not. I notice a little further along in your statement you make the statement that in the Ohio River Basin, for example, eight authorized reservoirs and two considered for authorization have been subjected to encroachments to the extent that they are no longer feasible.

That is because of greatly increased improvements in the areas where the reservoirs were planned or contemplated as being desirable.

General ITSCHNER. Yes, sir. That is due to increases in the amount of construction and the value of that construction in the flood plains.

Senator KERR. I figure that people build homes and industries in there where the cost now would be prohibitive from the standpoint of making it feasible; is that correct?

General ITSCHNER. Yes, sir.

Senator KERR. Now hasn't the building below these flood control reservoirs increased by leaps and bounds beyond the physical environment at the time a project was authorized?

General ITSCHNER. Very greatly; yes, sir.

Senator KERR. Your estimates made at the time of what the savings would be by reason of the prevention of floods were based and are based when made to this committee on the environment at the time the survey is made, isn't it?

General ITSCHNER. That's right, sir.

Senator KERR. It doesn't include an estimate by you of the prevention of damage in an area where heretofore, because it was flooded it was either undesirable for human habitation or industry, and it has changed so that after the project has been developed and completed, there will be great growth and expansion there. You don't give effect to that growth and expansion in your estimate as to the cost-benefit ratio?

General ITSCHNER. No, sir, we do not include in our computation of benefits from flood control any consideration of increased development in the flood plain, made possible by the project. We consider these benefits to be in the category of land enhancement, and they are considered in our computations as such.

Senator KERR. Actually then the situation is that to the extent that the area is improved and the value of the physical property there increased, the value of the prevention of floods proportionately increases?

General ITSCHNER. That is correct, sir. If I could give you two or three figures to illustrate that point, on the same overall basis, excluding the Mississippi Valley, because of its greater life, we found that over a life of 50 years all the projects constructed to date which cost $2.8 billion that I spoke of would return for every dollar spent $2.50 for pure flood control of existing construction in the flood plains.

Senator KERR. At the time they were constructed?

General ITSCHNER. Existing at the time they were constructed, as well as improvements we estimate would occur if the project had not been built.

Senator KERR. Yes

General ITSCHNER. And in addition $1.50 for the protection of construction that has been built in the flood plain since the project has been authorized, up to the present, making a total of $4.

Senator KERR. In the first 10 years?

General ITSCHNER. Yes, sir. The reason why that does not come out to $5, which you might say is what it should be, since 50 years is 5 times the 10 years of record so far, is that I have discounted both of these figures for the devaluation of the dollar, the inflation factor. That has been taken out.

Senator KERR. I would say, General, and I do not say it critically, it could be interpreted as being commendatory, I would say that you have maintained the reputation of the Corps of Engineers . I would say that you have maintained the traditional reputation for conservatism of the corps in making their estimates.

Genrral ITSCHNER. We strive to be conservative in our evaluation of benefits.

Senator KERR. I won't say that you have succeeded and that is not critical, that is commendatory, because it puts you in the position where you come here to the Congress they are justified in acting on your recommendations with the assurance that the project will have at least the value and the benefit that you give it.

General ITSCHNER. Shall I proceed, sir?

Senator KERR. Yes.

Senator RANDOLPH. Mr. Chairman, before he proceeds with his statement it is my desire to question the witness.

General Itschner, during my years in the House of Representatives, I had a continuing interest in the Potomac River Basin and the tributaries to that stream. West Virginia as you well know, is in a sense the father and/or mother of many rivers, including the Potomac. I have attempted to familiarize myself since coming to the Senate with the studies which have been carried forward in connection with the Potomac River and its tributaries. I am learning, of course, and I want to be helpful in connection with the further programing on this waterway. If appropriate at this time could you answer with reference to flood control only? Is the flood control problem, insofar as the District of Columbia is concerned, a minor, a median, or a major matter at the present time, speaking in terms of improvements and/or installations on the Potomac River and its tributaries?

General ITSCHNER. The District of Columbia, Senator Randolph, does have a flood problem. I would say that it is not relatively a very serious one, but a very severe flood would cause quite an appreciable amount of damage. The exact amount I am not able to say. This study which you mentioned and which is currently underway will develop the figures for flood damage in the District of Columbia.

Senator RANDOLPH. You have indicated that the flood control phases of the construction in or on the Potomac and its tributaries is not the major matter concerning the engineers at the present time. Is that correct, or am I in error?

General ITSCHNER. I did say in the District of Columbia, sir. I think that the flood problem is not as serious as in many places. But it is a real problem.

Senator KERR. As limited to the District of Columbia?

General ITSCHNER. Yes, sir.

Senator RANDOLPH. That is correct. I want to go further and ask you if the concern of the Engineers is related now in your specific studies more to adequate water resources and the pollution-abatement problem?

General ITSCHNER. The resolution under which we are making the comprehensive Potomac River study, sir, requires us to study the basin to develop the best solution for all the water-resource development and flood control problems in the basin, so we must consider all of them.

Now, pollution, of course, is a very serious problem in the Potomac River below Great Falls. The water supply problem is a serious one today and will become increasingly serious as years go by. If I had to say which one of all the problems was the most critical and will become even more critical in the future, I would, of course, say water supply.

Senator RANDOLPH. General Itschner, I refer to the action by the Public Works Committee in adopting a modifying resolution in connection with the comprehensive survey which you have mentioned, and which was followed by a directive from the Senate Appropriations Committee with reference to the Potomac River. Is this something that you feel will be damaging to the study of the Potomac River and its tributaries in an effort to cover all these fields in which you have indicated this very keen interest?

General ITSCHNER. I believe that any limitation on the study will be regrettable because with it the study will not give us the best development, which we always seek, for the solution of all the water problems.

I feel that we should be given the free hand that we had at the time the resolution was passed, so that we can propose to Congress what we, from our engineering viewpoint, consider to be the best overall solution.

The Congress then can accept or reject it in toto or any part thereof based upon other considerations.

Senator RANDOLPH. General, you will recall 1946. I was a Member of the House in that year, that there was a feeling, a very real concern on the part of literally hundreds of citizens of the State of West Virginia and of the adjoining Commonwealth of Virginia, that the Engineers were thinking in terms of multiple-purpose high dams on the Potomac, and if such a report were sent to the Congress, there might be a certain momentum behind it which could culminate in this type of installation or installations on the Potomac and its tributaries. They believed such a program, if finalized might destroy literally tens of thousands of acres of very productive agricultural lands in the areas in which I have made mention. For that reason, recalling the situation at that time, Senator Byrd of West Virginia and the Senator now attempting to be objective in his discussion of this matter with you, wished to obviate a repetition of that conflagration. It was that hope which caused us to proceed to urge an emphasis on the matters of adequate water supply and stream pollution abatement, coupled with flood control in the Potomac River. We wished to guard against the emphasis seemingly placed in 1946. We believed it to be necessary to lessen that tension, and not repeat again, in the period in which your study is now proceeding, the direction it once took.

Perhaps this is a little involved, but it is very important to West Virginia. I have had delegations within the last week calling upon me, expressing varying viewpoints on this matter. I am conscious also of the meeting sponsored a few days ago by the Corps of Engineers when some 150 persons, including perhaps 50 or 60 from West Virginia, were present at an all-day session here in Washington. It seemed to me that with these questions to the witness on matters of flood control, it was appropriate to discuss this subject, which is very near to us in West Virginia and relates itself also to the national capital area.

Are there other comments, General, that you wish to make on this matter?

General ITSCHNER. I might say, Senator, that in making this study of the Potomac Basin, the Corps of Engineers had no preconceived ideas as to a solution. I personally have no idea at all at this time as to what would be the best solution. Whether power, for instance, would be justified at one or more projects in the basin would have to be determined, and that is the manner in which we go about these studies.

We try to do the best we can in determining what we think is the best for the people of the country as a whole. Quite often it happens when we are considering reservoir projects, the benefits—or at least the major portion of them—accrue to the people living downstream. Not all, because the waters of that reservoir might be used by the

people upstream or the recreational features might be used by those people.

But inevitably there comes about a conflict of interest. People downstream often are protected by reservoirs against the ravages of flood. The people who live in reservoir areas lose their land.

Often that is quite valuable land because it is in the river bottom and very frequently it is some of the best land for agriculture.

That is all considered in perhaps a cold dispassionate manner in the survey report, because we consider the value of that land, and we consider the value of benefits from the project which must take that land, and we weigh the two and we finally come up with a recommendation. But it admittedly does not consider the fact that some people lose and others gain. We have no way of taking care of that factor. But on the whole the balance must be toward a gain or we do not recommend the project. I realize there is a great deal of controversy in the Potomac Basin. I can quite well understand it. I am always very sympathetic to the people who lose in these major development schemes. I do think, though, that unless we are instructed otherwise, we must come up with what we consider to be the best overall solution for the country as a whole. And I think it is incumbent upon us at the same time to point out these various factors that we weigh in coming to that determination.

Senator RANDOLPH. Mr. Chairman, only one other observation and I have concluded. Is it not a fact that, in the very nature of these surveys, what might appear to you to be very valid programing in 1946 would not be valid 10 or 12 years later? Is that not correct?

General ITSCHNER. That is quite possible; yes, sir.

Senator RANDOLPH. And within the corps you do modify the type of dams which you think should be built and the sites at which these dams would be located. Is that not true?

General ITSCHNER. Yes, sir.

Senator RANDOLPH. Mr. Chairman, I appreciate your cooperation in permitting me to interrogate the general on this very important subject. I thank the witness.

Senator KERR. You may proceed with your statement, General.

General ITSCHNER. Multiple-purpose reservoirs unquestionably will continue to be key weapons in meeting the challenge of effective water resource development.

They provide opportunity for reduction of flood damage by storage of excess runoff; for controlled use of stored water for municipal, industrial, agricultural, and navigation water supply; for the production of power; for low flow regulation; for recreation; and for fish and wildlife conservation; in various combinations consistent with the needs of the areas to be served.

Good reservoir sites are being lost at an alarming rate as development of our river valleys continues. In the Ohio River Basin, for example, eight authorized reservoirs and two considered for authorization have been subjected to encroachments to the extent that they no longer are feasible.

Six additional sites may be lost during the next 10 years if present trends continue. This pattern extends to the Missouri, the upper Mississippi, the lower Mississippi, and other basins throughout the country.

Senator CASE. Mr. Chairman?

Senator KERR. The Senator from South Dakota?

Senator CASE. Senator Cooper had to leave a few moments ago. He asked me at this point to ask a couple of questions with respect to this encroachment in the Ohio River Basin.

General Itschner, could you either state now or supply for the record a list of the eight reservoirs that were authorized and two that were considered which had been subjected to encroachments to the extent that they are no longer feasible in the Ohio River Basin?

General ITSCHNER. Yes, sir, I have that list if you would like to have it inserted in the record, or I could give it to you now.

Senator CASE. I think for this purpose probably it would be best to insert it for the record, and in each case to give a brief description of the nature of the encroachment. I think that Senator Cooper had in mind particularly where the six additional sites are threatened that it would be helpful if the nature of the encroachment could be given to see whether or not some local consideration might be given to modifying the encroachment to preserve the site.

General ITSCHNER. Yes, sir; I shall be very happy to furnish that information.

Senator CASE. Thank you.

(The information referred to follows:)

ENCROACHMENT ON RESERVOIR SITES IN OHIO RIVER BASIN

In general, various degrees and types of encroachment on reservoir areas in the Ohio River Basin are increasing flowage costs. Eight reservoirs previously authorized appear to be precluded from development at this time because of encroachment. One of these, Turtle Creek Reservoir, Pa., was deauthorized by the Flood Control Act of 1958 in connection with authorization of local protection measures. In the case of Clendenin Reservoir, W. Va., another of this group, an alternative project is under construction. Two additional reservoirs considered but not authorized also appear to be precluded from development at this time because of encroachment. In the case of six additional reservoirs, either authorized or considered but not authorized, the trend toward encroachment is such that development may be precluded on this ground within the next 10 years. Detailed information follows:

TABLE A—AUTHORIZED RESERVOIRS WHICH APPEAR TO BE PRECLUDED FROM DEVELOPMENT AT THIS TIME BECAUSE OF ENCROACHMENT

Turtle Creek Reservoir, Pa.

Location: Turtle Creek, Pa. (Monongahela River Basin).

Authorized by: Flood Control Act of December 22, 1944.

Deauthorized by: Flood Control Act of 1958.

Nature of encroachment: Subsequent to authorization of Turtle Creek Reservoir a western extension of the Pennsylvania Turnpike was built through the reservoir area, and extensive residential and commercial development occurred in the reservoir area near its head at Murrysville, Pa. Construction of the project would have necessitated raising of about 2.0 miles of the Pennsylvania Turnpike as much as 57 feet to clear the proposed reservoir-full level, and acquisition or protection of new developments at Murrysville, at an estimated cost of $6,100,000 under January 1957 prices and conditions. Turtle Creek Reservoir was deauthorized by the Flood Control Act of 1958. Local flood protection measures along lower Turtle Creek and lower Thompson Run were authorized by the same act.

Eagle Creek Reservoir, Ohio

Location: Eagle Creek, Ohio (Beaver River Basin).

Authorized by: Flood Control Act of June 28, 1938.

Nature of encroachment: The recently completed Ohio Turnpike, a four-lane, divided highway, crosses the South Fork arm of the reservoir area. To provide

a 5-foot freeboard for this crossing above the proposed reservoir-full level would require raising of about 2,400 feet of the turnpike. At the time of reservoir authorization the Harbison Walker Refractories Co. operated an extensive silica sand quarry in the Nelson Ledge on property along a line of the Erie Railroad where it crosses the reservoir area. This company subsequently acquired additional property for its continuing operations. The General Refractories Co., also, now has a silica sand quarry on property which would be involved by Eagle Creek Reservoir. The cost of project adjustments necessary to compensate for the above conditions has not been computed but would be large. The project is classed as inactive.

Clendenin Reservoir, W. Va.

Location: Elk River, W. Va. (Kanawha River Basin).
Authorized by: Flood Control Act of June 22, 1936.
Nature of encroachment: Subsequent to authorization economic development of the Clendenin Reservoir area resulted in very substantial increases in flowage costs and reduction in the practical limit on reservoir capacity from the 2.66-inch level originally contemplated to 1.79 inches of control over 1,130 square miles of drainage area. Selection of an alternative upstream site was deemed necessary. Sutton Reservoir, the selected alternative, will control 537 square miles and is now under construction.

Big Bend Reservoir, W. Va.

Location: Greenbrier River, W. Va. (Kanawha River Basin).
Authorized by: Flood Control Act of June 22, 1936.
Nature of encroachment: At the time of reservoir authorization railroad lines limited the practical capacity of this project to about 1.2 inches of runoff from 1,631 square miles of drainage area. Within this limit the level of development in the reservoir area was low, with resulting low flowage costs per unit of storage capacity. During the intervening period slow but steady economic growth occurred in the reservoir area, and field inspection has lead to the conclusion that construction no longer would be economically justified. This growth includes extensive development of summer homes and campsites in the vicinity of Bargers Springs upstream from the damsite, many of which lie below the top elevation of the flood control pool. The project is classified as deferred for restudy.

Poca Reservoir, W. Va.

Location: Pocatalico River, W. Va. (Kanawha River Basin).
Authorized by: Flood Control Act of June 28, 1938.
Nature of encroachment: At the time of project authorization storage of about 11 inches of runoff from 345 square miles of drainage area was proposed, and flowage imposed no serious obstacles to full development of the site. Subsequently, a transcontinental gasline crossing the reservoir site has been laid, and a multimillion dollar compressor station has been built in the reservoir area. Extensive residential, commercial, and highway developments serving workers in the Kanawha Valley industries also have taken place in the proposed reservoir area. Field investigations indicate that a reservoir without prohibitive flowage costs would be limited to a capacity of less than 5 inches of runoff, and that the general trend of development is such that no reservoir development at all will be feasible after a few years. The project is classified as deferred for restudy.

Steer Creek Reservoir, W. Va.

Location: Steer Creek, W. Va. (Little Kanawha River Basin).
Authorized by: Flood Control Act of June 28, 1938.
Nature of encroachment: An increase in the level of oil and gas development in the reservoir area has increased flowage costs to the point that unit storage costs at the Steer Creek site would be excessive. The project is classified as deferred for restudy.

Millersburg Reservoir, Ohio

Location: Killbuck Creek, Ohio (Muskingum River Basin).
Authorized by: Flood Control Act of June 28, 1938.
Nature of encroachment: Studies subsequent to authorization of this project revealed that capacity greater than that originally proposed would be necessary for effective operation during severe floods. However, the main line of the Pennsylvania Railroad and developments in the city of Wooster, Ohio, preclude increasing the capacity of the reservoir. The railroad was a limiting factor at the time of project authorization. Normal suburban expansion of the city of Wooster has introduced a further limiting factor. The project is classified as deferred for restudy.

Jessamine Creek Reservoir, Ky.

Location: Jessamine Creek, Ky. (Kentucky River Basin).

Authorized by: Flood Control Acts of June 28, 1938, and December 22, 1944.

Nature of encroachment: The project document plan provides for a flood-control pool at elevation 630. Studies in 1950 indicated that a pool elevation of 643 would be necessary. A large steam-electric generating plant subsequently constructed in the proposed reservoir area will require protection for any pool elevation above 615. Protection for a pool level of 630 would cost in the order of $5 million, and protection for a pool level of 643 would be impracticable. Alternative reservoir sites are being considered in connection with study of the Kentucky River Basin. The project is classified as deferred for restudy.

TABLE B—RESERVOIRS CONSIDERED BUT NOT AUTHORIZED WHICH APPEAR TO BE PRECLUDED FROM DEVELOPMENT AT THIS TIME BECAUSE OF ENCROACHMENT

Clear Fork Reservoir, W. Va.

Location: Clear Fork Guyandot River, W. Va. (Guyandot River Basin).

Authorized by: Not authorized.

Nature of encroachment: Investigations immediately following the January 1937 flood indicated that relocation costs would have been relatively small at the Clear Fork site. Shortly thereafter, the Virginian Railway Co. constructed an extension running the entire length of the proposed reservoir area. Relocation costs now would be high for any reservoir of substantial size at the Clear Fork site.

Big Walnut Reservoir, Ohio

Location: Big Walnut Creek, Ohio (Scioto River Basin).

Authorized by: Not authorized.

Nature of encroachment: This reservoir was considered as a possible substitute for authorized Deer Creek Reservoir. Subsequently, local interests developed the site for water supply purposes only. The dam design and relocations are such that modifications to include flood control or other purposes would not be economically feasible.

TABLE C—AUTHORIZED RESERVOIRS AND RESERVOIRS CONSIDERED BUT NOT AUTHORIZED WHICH MAY BE PRECLUDED FROM DEVELOPMENT WITHIN THE NEXT 10 YEARS BY ENCROACHMENT

Burnsville Reservoir, W. Va.

Location: Little Kanawha River, W. Va. (Little Kanawha River Basin).

Authorized by: Flood Control Act of June 28, 1938.

Nature of encroachment: Recent developments in the vicinity of this project indicate that extensive and rapid encroachment into the reservoir area may occur in the near future. Only general encroachment has occurred since authorization. State Route No. 5 which follows the river for a distance of 5.5 miles in the reservoir area was an unpaved road at the time of project authorization. It has since been improved and surfaced and steady growth of commercial and residential building along this route has occurred. The project is classified as deferred for restudy.

Birch Reservoir, W. Va.

Location: Birch River, W. Va. (Kanawha River Basin).

Authorized by; Flood Control Act of June 28, 1938.

Nature of encroachment: Recent economic development in the vicinity of the proposed Birch Reservoir area indicates that extensive and rapid encroachment into the reservoir area may occur in the near future. Actual encroachments in the flood control pool have been minor to date. A secondary State route through the reservoir area has been improved and surfaced and some additional buildings have been constructed. Rapid expansion in residential and commercial building has occurred during recent years along Elk River from Charleston to Sutton. Similar development in the Birch Reservoir area may be expected.

Rocky Fork Reservoir, Ohio

Location; Rocky Ford of Paint Creek, Ohio (Scioto River Basin).

Authorized by: Flood Control Act of June 28, 1938.

Nature of encroachment: Plans were made for development of this site for flood control and recreation by the Federal Government and the State of Ohio. The State has constructed recreational measures with provisions at the dam which

would permit increased height for flood control. Because of the large recreational potential it is possible that public demand will lead to developments unfavorable to expansion of the project for flood control purposes. The State did not purchase all lands required for the future flood control pool and rapid development of privately owned lands around the present lake has occurred. Some State-owned developments also are located within the area required for future flood control use. This project is classified as deferred for restudy.

Yatesville Reservoir, Ky.

Location: Blaine Creek, Ky. (Big Sandy River Basin).

Authorized by: Not authorized.

Nature of encroachment: Recent developments in this project area indicate that extensive and rapid encroachment into the reservoir area may occur in the near future. Developments in the reservoir area in recent years have consisted mainly of betterment of State and county highways and the development of mineral rights, mostly oil.

J. Percy Priest Reservoir, Tenn.

Location: Stones River, Tenn. (Cumberland River Basin).

Authorized by: Flood Control Act of June 28, 1938, and River and Harbor Act of July 24, 1946.

Nature of encroachment: At the beginning of World War II, the Sewart Air Force Base was constructed as a temporary facility, but has now been converted to a permanent operation. The reservoir at maximum pool would extend into the base, requiring remedial measures. Two major pipelines have been constructed across the reservoir area. Power and telegraph lines are being added continually as the nearby Nashville metropolitan area expands. Accompanying this expansion some land previously in agriculture in the reservoir area has been subdivided for residential use and county highways have been improved and expanded to serve the resultant homes and related facilities. The encroachments described would increase reservoir costs in the order of $4.5 million. The project is now in the deferred for restudy category.

Three Islands Reservoir, Tenn.

Location: Harpeth River, Tenn. (Cumberland River Basin).

Authorized by: Flood Control Act of June 28, 1938, and River and Harbor Act of July 24, 1946.

Nature of encroachment: Present tentative highway plans call for construction of four bridge crossings on the Harpeth River within the reservoir area, as well as several miles of approaches. Continuing contacts are being made with the State highway department and working relationships also are maintained with the State water engineer. The project is in the deferred for restudy category.

General ITSCHNER. Coordination during the survey stage to obtain the fullest possible Federal-local agreement on water resource development needs, objectives, and plans—both immediate and long range—should be helpful. Basic procedures for survey-stage coordination are well established.

In 1956 we initiated an expanded, positive program to inform Federal agencies and States, counties, and municipalities concerning plans for authorized reservoirs. The purpose is to promote better understanding of these projects and to serve as a guide for local planning.

This program has brought on numerous inquiries with regard to projects, indicating a general desire to cooperate.

Senator CASE. General, at that point, if the chairman will permit, in connection with our highway program, we have provided by statute that where towns are bypassed, that the highway authorities shall conduct public hearings.

We have extended that also to include an opportunity for hearings for rural areas that feel themselves adversely affected. Now you state here that you have initiated an expanded positive program to inform agencies, counties, States, and municipalities. Is there any statutory

requirement with respect to public hearings by the Corps of Engineers when you propose to construct a project?

General ITSCHNER. We always do hold public hearings, once a survey is initiated, usually in the early stages and again after conclusions are close to being reached, and any intermediate hearings that we feel are necessary in oder to conduct a proper study.

Senator CASE. The corps did conduct hearings recently in South Dakota at our request, which I think was very helpful in getting a better understanding of the procedures of the corps, and also resulted in some modification which I think was for the good of all concerned—the maximum good of all concerned.

Do you as a matter of policy hold these hearings if there is evidence of a local misunderstanding or considerable questioning after the projects is once authorized?

General ITSCHNER. No, sir. Once the project is authorized by Congress, we do not hold a public hearing, partly because of the expense involved.

We would have to have an appropriation for that purpose. Now we are always, of course, happy to have the views of local interests, and we do participate with them in any discussions that they may desire to have. But we don't call regular public hearings.

Senator CASE. It is my personal belief that the public relations values to the corps in some instances would offset the dollar cost of holding hearings. I don't know what the cost was at that hearing at Pierre, but I am sure that the corps is reaping and will continue to reap some benefits of a better understanding of what it is going to do by reason of having held hearings.

General ITSCHNER. Senator, we also do have hearings, if desired or considered necessary by us at the time the initial appropriation is made for planning a project, and during the planning stage. But in some projects there is a long interim period, as you know, between the authorization and the initial construction or planning appropriation, and it is not customary for us to hold hearings during that period. If there was a great demand for it, I feel sure that we would be very happy to do it.

Shall I continue, sir?

Neither preauthorization coordination or postauthorization publicity, of course, are positive controls for preventing encroachment.

And, certainly, all development in potential reservoir areas cannot be restricted. Nevertheless, loss of essential reservoir sites or costly relocation of improvements must be reduced if long-range water resource development needs are to be met.

Federal, State, and local governments might very well take positive action here by wise choice of location of public improvements such as highways, airfields, and utilities.

Fundamentally, the planning concepts which I have mentioned seek to avoid the waste and ultimate failures inherent in piecemeal, uncoordinated, and shortsighted water resource development. We are striving to employ them in our planning work.

They must be given the closest continuing attention if we are to achieve the goal of optimum control, development, and utilization of our water resources in the public interest.

The omnibus river and harbor and flood control bill, as it comes to you from the House of Representatives, provides for construction of

36 navigation projects, 2 beach erosion control projects, 10 flood control projects, and increase in the monetary authorizations for 6 comprehensive river basin plans.

In addition, the bill provides monetary authorization to complete Barkley Dam in Kentucky, and authority to make investigations in the interest of navigation, flood control, and other purposes at a number of localities throughout the Nation. Moneywise, the bill provides authorization as follows:

Title I, rivers and harbors:	
Navigation projects (36)	$86, 581, 300
Beach erosion control projects (2)	371, 500
Monetary authorization (Barkley Dam, Ky.)	146, 000, 000
Total, title I	232, 952, 800
Title II, flood control:	
Flood control projects (10)	45, 357, 700
Increased basin authorizations (6)	379, 000, 000
Total, title II	424, 357, 700
Grand total	657, 310, 500

Of which $525 million is for increased monetary authorizations, either rivers and harbors or flood control.

Some of the projects included in the bill will function essentially as independent units in meeting local water resource development needs.

The beach erosion control projects may be considered in this category. Many, however, are elements of plans or programs of broad scope, as, for example, the Great Lakes harbor projects. In general, these provide for deepening of existing harbor improvements in a pattern consistent with the overall needs of Great Lakes commercial navigation, taking into account the Great Lakes connecting channels project now underway and the impetus of the recently opened St. Lawrence Seaway.

The basin monetary authorizations apply to areas where long-range comprehensive development plans are in progress. The authority for general investigations will permit study of additional problem areas.

These works and programs are consistent with the Nation's water resource development requirements.

Members of my staff who are familiar with the technical details of our projects and programs are available to furnish such information on them as you may require.

I wish to thank you for this opportunity to discuss our water resource development activities with you.

Senator KERR. Thank you, General. Are there further questions?

Senator CASE. Mr. Chairman, I think that probably he would not have with him information that I would like to get.

I would like to ask that the general or his staff submit a memorandum for the hearing on the status of the study on the Vermillion, the Big Sioux River, and the prospective dates for the reports to Congress on them, whether or not they could be expedited sufficiently for consideration in connection with this bill.

(The information referred to follows:)

STATUS OF INVESTIGATIONS FOR FLOOD CONTROL AND OTHER PURPOSES ON THE BIG SIOUX AND VERMILLION RIVERS

The investigation and report on the Big Sioux River is being made in response to a resolution adopted July 29, 1955, by the Committee on Public Works of the House of Representatives. Work on this investigation is underway by the District engineer, Omaha district, under the direction of the division engineer, Missouri River division. The investigations by the reporting officers are well advanced and the report on these investigations is scheduled for submission to the Chief of Engineers in December 1959. It is expected that the report will be submitted to Congress during late summer of 1960.

The investigation and report on the Vermillion River, S. Dak., is being made in response to a resolution adopted February 29, 1956, by the Committee on Public Works of the U.S. Senate, and other authority. The report of the district and division engineers has been received and reviewed in the Office, Chief of Engineers. This review has revealed certain technical problems which require some further analysis by the reporting officers. Results of this analysis are scheduled for submission to the Chief of Engineers by mid-September. It is expected that the report will be submitted to Congress in midspring of 1960.

The review and processing of reports to Congress after receipt from the reporting officers follow certain procedures which are required by law. After the report is reviewed by the staff of the Chief of Engineers, a public notice is issued by the division engineer informing all interested parties of the findings contained in the report of the reporting officers. At the time the public notice is issued, the report is referred to the Board of Engineers for Rivers and Harbors for review and recommendation.

Upon completion of the review by the Board of Engineers for Rivers and Harbors, the proposed report of the Chief of Engineers is sent to the Governors of the States involved and interested Federal agencies for review and comment. A period of 90 days is allowed for this review. After receipt of the comments of the States and Federal agencies, the report is referred to the Bureau of the Budget for determination of the relationship to the program of the President of any improvements that may be recommended for authorization. On receipt of the comments of the Bureau of the Budget the report is submitted to Congress by the Secretary of the Army. Normally, a period of 6 to 9 months is required from the time the public notice is issued on a report until the report of the Chief of Engineers is sent to Congress.

Although the processes of review can be hastened to some extent, considerable time is involved from the time the report is received in the Office of the Chief of Engineers and its submission to Congress.

Senator CASE. Also, I should like to have a considered statement on the possible values and benefits if a dam were built on the White River in South Dakota south of Reliance. It is one on which some study has been made, I know, giving the effect on the retarding of siltage for Fort Randall Reservoir. As suggested, the dam has been proposed as one that would produce considerable hydroelectric power, but I do not know that the values of the siltage control on Randall Reservoir have been evaluated and I would like to see that.

(The information referred to follows:)

The statement on control of silt in the Fort Randall Reservoir is as follows:

Consideration was given to a reservoir on the White River in South Dakota near Reliance in studies for a report on the White and Bad Rivers, S. Dak., and Nebr., published as Senate Document No. 189, 73d Congress, 2d session. The reservoir, designated as the Reliance Reservoir, was considered for flood control and augmentation of flows for navigation on the Mississippi and Missouri Rivers and alternately for development of hydroelectric power production. The project at that site was found not economically justified at that time.

The Reliance Reservoir project considered would have a total storage of 275,000 acre-feet. Assuming that the reservoir would be operated for development of hydroelectric power with 75,000 acre-feet of drawdown storage and 200,000 acre-feet dead storage, the estimated deposition of sediment in the reservoir would average 20,000 acre-feet annually. This rate of deposition would result in filling the dead storage area completely in 10 years, after which the sediment would again be deposited in the Fort Randall Reservoir.

Senator CASE. Also, I would like to have a memo for—I don't know that this needs to go in the hearing but I would like to have a memorandum—on the agreement that was made, if it was made, between the Corps of Engineers and the State of South Dakota for the elimination of the highway bridge at the so-called Wheeler Crossing. I know that a crossing is now provided on Randall Dam, but that is many miles downstream from the Wheeler Crossing.

Many people in the area feel that that was not an adequate replacement. So I would like to know what the basis for or nature of the agreement between the State and the Corps of Engineers was, if there was an agreement for substituting a dam crossing several miles downstream, and what would be the cost of a replacement crossing on a line approximately between the towns of Platte and Winner, S. Dak.?

General ITSCHNER. What was the last name?

Senator CASE. Platte and Winner, to make amends for the loss of the crossing or the pushing of it many miles downstream, and the elimination thereby of any crossing between Randall Dam and the bridges at Chamberlain?

General ITSCHNER. Yes, sir, we will be very happy to furnish that information.

Senator KERR. We will recess subject to the call of the chairman and again, General, we want to thank you very kindly.

We will have the other members of your staff report on the individual areas.

(Whereupon, at 12:25 p.m., the hearing recessed subject to the call of the chairman.)

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